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JOURNAL  
OF THE  
ASIATIC SOCIETY  
OF  
✓  
BENGAL.

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EDITED BY  
THE SECRETARY AND SUB-SECRETARY.

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VOL. XII.  
PART I.—JANUARY TO JUNE, 1843.  
NEW SERIES.

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"It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science, in different parts of *Asia* will commit their observations to writing, and send them to the Asiatic Society, in Calcutta; it will languish, if such communications shall be long intermitted; and will die away if they shall entirely cease."—SIR WM. JONES.

CALCUTTA :  
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# JOURNAL

OF THE

## ASIATIC SOCIETY.

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*First Report by Dr. JAMESON of his deputation by Government to examine the effects of the great Inundation of the Indus. See Journal As. Society, Vol. X p. 615.*

*From the Envoy to the Court of Lahore, to T. H. MADDOCK, ESQ. Secretary to the Government of India, with the Governor General, dated Camp Kurnaul, 28th January, 1843.*

SIR,—I have the honor to transmit a copy of a Report received some time ago from Mr. W. Jameson, Assistant Surgeon, of his expedition to the Indus in 1841, to examine the effects of the flood caused by the disruption of the obstacle that had for several months obstructed the course of the Indus within the mountains.

2. Dr. Jameson failed in his intention of penetrating up the line of the Indus to the supposed locality of the cause of this extraordinary inundation, owing to an attack made upon him and his Sikh escort while he was making a geological survey of the Khuttuk hills, west of Peshawur, where coal beds were believed to exist. When, after many weeks, he was liberated by the assistance of the Sikh Government from the fort of Kohat, the Cabool insurrection and its consequences had rendered it impracticable for the Sikhs to secure for him a safe passage up the line of their western frontier, by which it had been proposed to convey him to, or towards, Gilghit and Khafferistan.

3. I had introduced Mr. Jameson to the Lahore court, where he was cordially received. I had provided him with presents suitable to the wild people he was going to visit. He had received the usual presents and

“*zeafuts*” at the durbar, and was keeping, as instructed by me, a debtor and creditor account of all such transactions. The whole, however, was plundered, leaving a balance on that account against Government of Rs. 2,887 : 7 : 5, which amount I have embodied in my Toshah Khanah account, which is periodically submitted for the sanction of Government.

4. I beg leave to annex an estimate of the value of Mr. Jameson's private property. He lost every thing he possessed, excepting the clothes upon him. Some compensation to a scientific and enterprising young man, who was thus employed by the orders of his Government, would, I think, be money well laid out.

I have, &c.

(Signed) GEORGE CLERK, *Envoy*.

*Envoy's Office, Camp Kurnaul,*  
28th January, 1843.

(Copy.)

TO GEORGE CLERK, ESQ. *Governor General's Agent, North Western Provinces.*

SIR,—In reporting my arrival at the Political Agency, North Western Frontier, I have the honor to lay before you a brief statement of the route I followed in crossing the Punjab, and from the Indus to Peshawur; at the same time premising, that I shall as soon as possible give a detailed report of my proceedings, which I regret to say must be very imperfect, owing to the loss of all my notes, collections, &c.

2nd. I have already communicated to you what passed at the interviews I had the honor to receive from His Majesty Sheir Singh.

3rd. From Lahore attended by an Agent of the Durbar, Alif Shah, twenty Suwars, a Havildar, and eight Sepoys, I proceeded in a NNW. direction, crossed the Chunab at Ramnuggur, and from thence to Jelalpore on the Salt range. Here I remained for some time to examine the interesting geological phenomena presented, then marched along the foot of the mountains to Pind Dadur Khan, opposite to which, but about three coss distant, are the great Salt mines, named the Koura mines. From the mines all the salt is brought to Pind Dadur Khan, and then sold by Rajah Golaub Singh's officers. After visiting these mines, and examining the neighbouring country, I ascended the hills at Bara, and marched to Maree on the Indus, via Choia, Sidan Khan, Khotas,

Durabbi, &c., on a generally barren country, a characteristic mark of these thinly populated mountains. Here and there, only in the neighbourhood of villages, was vegetation met with.

4th. At Maree, I first witnessed some of the devastating effects of the river's inundation that had taken place about six months before, and as you had directed my attention particularly to the examination of this district, under which is comprehended that of Kalabágh, distant about half coss, and on the eastern side of the river, in order to ascertain whether coal was to be met with fit for steam vessel purposes, I remained here a few days, and then prosecuted my researches up the river as far as Sharkar, to determine if the same system of rocks (saliferous system) existed to the northward, and also to witness the extent of the ravages committed by the great *debacle*. After an absence of six days, I returned to Kalabágh, re-examined the various interesting fossiliferous deposits in that neighbourhood, abounding in the remains of fish and saurian animals (?) and coprolites. I mark saurian animals with an interrogation, as the fossils were not of so perfect a nature, as to allow me to say definitely, whether the remains belong to saurian reptiles or sauroid fishes. They are met with in a red sandstone, (the equivalent of the new red sandstone of Europe,) which is superimposed by the red marl, along with which the rock salt, gypsum and alum slate, occur. In some places a limestone is met intervening between the red sandstone and red marl, abounding in fossil organic remains; and at Jellalpoore, where in some places the red sandstone is wanting, we have the marl resting immediately upon a limestone without fossils, and presenting all the mineralogical characters of the magnesian limestone of Europe.

I left Kalabágh on the 26th for Cohat, following the route of Elphinstone.

5th. From all the chiefs whose country I passed through, viz. Alla Yar Khán, of Kalabágh, Ghoolam Mustafa Khán, Ghongree of Shakur-durrah, Russool Khán Khuttuk of Elaichi, I received attention, and was by each of them furnished with a guard, having, as requested by the Maharaja, discharged at Maree the twenty Suwars.

6th. I arrived at Cohat on the evening of the 29th November, and was met by Futeh Khán, the Naib and brother-in-law of Sooltán Mohammad Khán, in whose name all orders are issued, and the revenue collected. Next morning he again waited on me, accompanied by several

chiefs, (Aga Medi Khán, Oomr Khán, &c.) the Lahore Killadar, and Alaf Shah. Aga Medi Khán apologized for Sirdar Kadar Khán not visiting me, he being unwell. After some general conversation, I was asked the object of my journey, how long I intended to remain, &c. In reply I stated, that I would proceed forthwith; Futeh Khán Aga Medi Khán then remarked, as the former had done the evening previous, that the direct route to Peshawur was not safe, several parties having been lately plundered by the Afreedies. To confirm what they said, they referred to Maharaja Sheir Singh's Killadar, who corroborated their statement, and remarked that now no Sikh party could proceed in safety by this route. Such being the circumstances, and there being no object to be gained in proceeding by this route, I proposed to march via Attock. To this they objected, and remarked that it was unnecessary; for, if I would inform General Avitabile, arrangements would be made in a few days to enable me to proceed by the direct route. Alif Shah then asked them (chiefs) why they did not summon the chiefs of the Afreedies? To this they replied, that since the departure of Sultan Mohamad Khán, who had been called to Lahore by orders of the British Government, they had lost all control over the hill tribes. I wrote to Captain Mackeson, and mentioned what I had been told by the authorities of the place, and at the same time intimated that I would either proceed by Attock, or by the direct route to Peshawur, as he should deem fit.

At the interview, the chiefs alluded to the unsettled state of their country; and said that during the night a party of Afreedies had visited my camp, and carried away a report that I had much treasure, (this report was prevalent in the bazar of Cohat, and appears to have reached Peshawur, Captain Mackeson having mentioned it in one of his letters,) and that unless I removed my camp within the walls of their fort, they would not be answerable for its safety. Alif Shah having urged me to adopt this measure, owing to the weakness of my guard, and the authorities refusing to strengthen it with some of their own people, I reluctantly did so, imagining that it would be the means of confirming the hill tribes in their supposition. The true cause of the chiefs being so anxious for me to quarter in their fort I afterwards ascertained, and shall forthwith notice.

In the evening I removed to the fort of Sirdar Kader Khan, the nephew and son-in-law of Sooltan Mohamad Khan. It is rather a forti-



fied village, having a high mud wall, and at the four angles bastions. Nearly all the villages that I saw beyond the Indus were fortified in a similar manner; from the town of Cohat it is distant about a quarter of a mile. The town of Cohat consists of several divisions or villages apart from each other, and in the centre there is a large mud fort garrisoned by three hundred of the Lahore troops. Formerly the guard was relieved every six months, but the present party had been there upwards of a year, and without any prospect of relief or pay.

Next day (1st December) I was visited by Sirdar Kader Khan, who apologised for not visiting me on my first arrival. He was particularly inquisitive regarding the objects of my journey, the cause of my coming to Cohat, &c.

7. When at Kalabágh, and prior to ascending the river, I wrote to Captain Mackeson, mentioning the extraordinary rumours in regard to our troops being in a precarious position not only at Cabul and Jellalabad, but also in many other parts of Affghanistan. Three days after reaching Cohat the answer to this letter reached me, which confirmed the melancholy intelligence received from the natives at Mukud on the Indus, and elsewhere. This was the first authentic information that I had received of the state of affairs to the North West since I left Lahore; none of the letters which you did me the honor to address to me having come to hand.

On the 4th, no answer to the letter addressed to Captain Mackeson having arrived, I told the chief that it would be absolutely necessary for me to march *viâ* Attock, as the season was rapidly advancing; that I had waited two days longer than the time specified as necessary for the receipt of an answer, and as I had stated to Captain Mackeson that I would proceed by either the Attock or the direct route, I should no doubt find that the chiefs through whose territories I would pass, had been informed by General Avitabile of my intentions. Why the answer had not reached, they could assign no reason, further than the *cossid* had been seized by the Afreedies, and detained; and they remarked, that if I would remain a day longer, they would send off forthwith another; they further stated, that the route *viâ* Attock was almost impracticable for camels. This I afterwards ascertained to be incorrect. Early next morning Sirdar Kadar Khan came to my tent, and stated that the carrier which he had dispatched would certainly arrive in the course of the day.

About six o'clock on the evening of the 6th, Duria Khan, one of the Afreedi chiefs in the pay of General Avitabile, arrived in company with Ibrahim Khan, retainer of Shahzada Houssum Khan, a brother of Dost Mahomed, and pensioner of the Sikh Government. They visited me with Alif Shah and delivered a note from Captain Mackeson, intimating that they had been sent by General Avitabile to conduct me by the direct route to Peshawur. With the former there were 50 followers armed with jezails, and at their urgent request I delayed my departure till the 8th. In regard to the directed route, they stated that it was perfectly safe.

8. On the evening of the 7th I received another letter from Captain Mackeson, advising me not to put too much faith in Duria Khan, and that unless the Cohat authorities, as also the Lahore agent, agreed on the practicability of the water, not to proceed by it. On the receipt of this note I sent for Alif Shah, and explained its contents, and also mentioned that Captain Mackeson had sent a Persian letter for Seyed Kasim Khan, requesting him to give me every assistance, which I had transmitted to him through Futteh Khan. He then left me, and returned again in about half an hour, and stated that there would be no annoyance whatever en route, as all the chiefs were to accompany me across the Pass; that the letter sent by Captain Mackeson was not for Seyed Kasim Khan, but for Aga Medi Khan, and that all would be ready to move at day-break next morning. Futteh Khan afterwards waited on me and reiterated the words of Alif Shah.

9. Early next morning (8th) I commenced my march, accompanied by the chiefs (Futteh Khan, Aga Medi Khan, Duria Khan and Ibrahim Khan) with their followers.

The Pass formed by the Teera or Khyber range of mountains, which separates the Peshawur from the Cohat vallies, is about two coss distant from the town, and rises to a height of upwards of a thousand feet; its entrance, between two lateral or subordinate ranges, is protected by a small mud fort garrisoned by Futteh Khan's sepoy. Here I was requested to remain; a sepoy, who had gone on to reconnoitre, having reported that a large body of men, amounting to several hundred, had assembled at the summit of the Pass, and that it was their intention to dispute our passage; the alarm was given, and the party of the chiefs, amounting to nearly two hundred horse and foot, was joined by



as many more. A council was held, and it was decided that the chiefs should first go on, and make an arrangement with the Afreedies. After a delay of about half an hour, a message was sent to me to advance, and also a request that I would give particular orders for no one to straggle in the rear; to prevent this I ordered the laden camels, mules, &c. to go in advance, as the ascent was both very steep and rugged, so much so as to induce Alif Shah and several of the Afghans to dismount and lead their horses. Here and there Afreedies, in parties of two and three, were seen moving about on the adjoining hills, watching our proceedings, but all remained quiet till the baggage had reached the summit of the Pass, on which a matchlock was fired as a signal, and from all sides armed men issued. The hills immediately above us, where not a man was seen the moment before, were now covered, and they opened on us a heavy fire, at which the Dooranis, both horse and foot, fled to shelter; not one of them returning a shot, though they were all well armed. I had to run the gauntlet of a heavy fire, but no sooner was I out of the range of their matchlocks, than all firing ceased. I remained for some time at the mouth of the defile, to see whether any of the Dooranis would join me, but none of them doing so I returned to the fort with my followers, of whom however nine were missing; viz. Alif Shah the Sikh Agent, a Havildar and two Sepoys, Lahore service, a servant of the first mentioned Ali Bukhsh Chupprosee of the Ambala agency, two of my own private servants, and a Sepoy; three of these, desperately wounded, (one of whom died a few days afterwards,) were brought to the fort by Futteh Khan's people; the bodies of the others, (one excepted, said to have been cut to pieces,) were recovered and interred next day. The Sikh agent was among the killed.

10th. About an hour after my arrival at the fort, Sirdar Kadar Khan came to me, condoled in the loss that I had sustained, and abused his people for taking me by that route. One by one the different chiefs joined us, each assigning a reason why I had been attacked, and among the number Aga Medi Khan, who stated that he was severely wounded, as did also others who were with him; his wound however was nothing but a contusion received by a fall from his horse, which was shot under him. It was also stated that many more had been wounded, and many horses carried off. This statement I afterwards

found out to be incorrect. In the evening the chiefs were joined by Seyed Kasim (Khán, the first time that I had seen him) who was received with marked respect by Sirdar Kader Khán and others. On asking Futteh Khan, after all the others had left, (who conducted me to a small mud hut for my residence) why his people did not assist me? he replied, that if they had done so, that they (the Dooranis) would have been massacred to a man; that the principal tribes by whom I was attacked were the Bazote, Automkhail and Parkhail, whose chiefs were either in the pay of Captain Mackeson or General Avitabile; viz. Alum Khan, Zemaun Khan and Ishonail Khan, in that of the former; and Rehmit Khan in that of the latter; that Seyed Kasim Khan had aided and abetted them, and that he was a thief and a robber, and at the head of a large banditti who inhabited villages close to Cohat. This is the reason I attribute why the chiefs (Dooranis) were so anxious I should quarter in their fort, fearing lest I should be attacked close to their town.

11th. Next morning I was informed by Duria Khan and Ibrahim Khan, that the cantonments at Caubool had been carried by assault and all the British troops massacred, and this was stated on the authority of a letter said to have been received by General Avitabile, and that the whole country was up in arms. They advised me to leave forthwith, and attempt to cross the Pass during the night. Shortly after they had left me I was visited by Futteh Khan, who asked what I intended to do. I replied that he knew best, and that therefore I would be guided by him and Sirdar Kader Khan, as I was completely in their power. I told him what had been mentioned by Duria Khan; to this he answered that he had double the strength of his garrison, and that as long as I remained in his fort, he would be answerable for my safety.

12th. That same day (9th,) I received a letter for Captain Mackeson, stating, I hear that Duria has gone to bring you to Peshawur by the direct route; he can do it if he likes. The manner however in which both he and his people had conducted themselves the day previous, shewed that I had nothing to expect from him, the reason he assigned for not assisting me being, that he had not received orders to quarrel with these tribes.

13th. That the Dooranis were aware of the attack being intended, I have not a doubt; but probably were obliged by policy to lead me into the snare. They were at the summit of the Pass a quarter of an

hour before me, but instead of giving the alarm, they remained quiet till I was completely entangled; the first notice I had, as mentioned, of the hostile intention of the hill tribes, was a savage yell, and discharge of matchlocks. If the statement is true, the accuracy of which I have no reason to doubt, that the tribes mentioned were the principal leaders in the attack, then it was impossible for any body of men to enter the Pass without being noticed by Futteh Khan's garrison. To corroborate it, Futteh Khan stated, that all my property was sold in their villages. It is more than probable that the cause why the credit is given to the Bazote Autimkhail, &c. tribes is owing to their chiefs being patronized by Captain Mackeson; the Douranees on the other hand, being excluded from his durbar. But of this, viz. disunion among the tribes inhabiting the Cohat valley, the population of which is estimated at 5,000, there is no doubt, nor are the Douranees on very friendly terms with their neighbour Rossul Khan, whose resources ( $4\frac{1}{2}$  lacs,) surpass those of Sooltan Mohamed Khan to the west of the Indus.

14. On the 10th, a cossid arrived from Lahore, with parwanehs from the Maharaja and Minister for Alif Shah, giving him orders to take on the suwars. The man contradicted the statement made to me the day before by the Dooranees, that the Lahore durbar had refused permission to the British troops to pass through the Punjaub, (having passed a large force at Ramnuggar,) which had the effect of altering much of their tone; some of whom were most disrespectful, particularly an individual named Hubbitoula Khan. A few days afterwards Duria Khan left me, having told him that I did not at present require his services; but if afterwards I found that they were necessary, I would send for him. After remaining for some time in Cohat, I offered Futteh Khan Rs. 1,000, for a guard to the Indus viâ Honshialgur, to which he agreed after some demur, and two hours before day-break on the morning of the 28th, I left in company with him and several other chiefs, with a strong body of horse and foot, and crossing the mountainous country belonging to the Afreedies got into the country of Russul Khan, one of whose people joined us. Several of the chiefs returned, as they stated their presence was now unnecessary. Nothing worth noticing happened. In the evening we halted at Pershai, a town belonging to Russul Khan, three coss from the river. His brother, Sirdar Khan, waited on me, and shewed me every attention. Early next morning I marched to the

river in company with Futteh Khan, Oomr Khan, &c. where after presenting them with an order on Peshawur I dismissed them, and then crossed and proceeded to Gumut, from thence marched to Peshawur via Hassun Abdál and Attok, where I arrived on the 6th, having here and there met with much difficulty in procuring bearers for the two wounded men, our story being in general discredited. I left Peshawur again on the 10th, having received four letters ordering my return, and arrived at Feerozepore on the 28th, accompanied by a small guard from General Avitabile.

I have the honor to be, Sir,

Your obedient humble servant,

(Signed) W. JAMESON,

*Assistant Surgeon, on a Deputation to the*

*Camp Lahore, March 17, 1842.*

*Sources of the Indus.*

*DR. JAMESON'S Report on the Geology, Zoology, &c. of the Punjaub and part of Affghanistan.*

TO G. CLERK, ESQ. *Governor General's Agent for the Affairs of the Punjaub.*

SIR,—I have the honor to transmit the first part of my Report, comprehending the Geology of the Salt Range of the Punjaub, and of a part of Affghanistan. I regret that, owing to the loss of all my Notes (a small Note Book excepted) and collections, it is so very imperfect, but still, I trust, it contains some observations worthy of attention.

I have not alluded to the great *debacle* of the Indus, but have deferred its consideration, as also the Zoology of the Punjaub, to the second part of my Report.

I have, &c.

*Ambala, June 29, 1842.*

(Signed) W. JAMESON, A. S.

*On deputation to the Indus.*

*On the Geology, Zoology, &c. of the Punjaub, and of a part of Affghanistan. By WILLIAM JAMESON, ESQ. M. A., S. C., M. S. C., &c. on deputation to the Indus.*

The following observations refer to those parts of the Punjaub and Affghanistan which I have personally visited. Prior to crossing the



Sutledge, I had the good fortune to consult Colonel Garden, Quarter Master General, from whom I received much valuable geographical information regarding the countries to the N. by W. and N. of the Indus. With him I marked out the best line of country to traverse, in order fully to accomplish the main object of my journey; viz. to ascertain *the cause of the great debate of the Indus*, which had taken place a few months before (June 1841,) and caused vast destruction to life and property. Mr. Clerk, on whose representation I had the honor to be appointed by Government to undertake the investigations, sanctioned the route laid down; and on applying to Maharaja Shere Singh for permission for me to proceed through his dominions, his Highness, on ascertaining the object Government had in view, not only complied with Mr. Clerk's request, but also, with his usual liberality, appointed an agent, and a contingent guard to attend on me, and at the same time transmitted orders to the Governors of the different districts to afford me every assistance and protection. The murder of the agent at Cohat, the unsettled state of the Gilghit country, and other circumstances which shall be afterwards noticed caused my recall, before I had proceeded far on my journey.

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## PART I.

### *General Observations on the Punjaub, and on the Geology of the Salt Range, and of a part of Affghanistan.*

*Punjaub.*—The empire included under the name of the Punjaub, is now the most important and extensive governed by any independent native prince in India, not only from the great resources at its command, but also from its position, as it commands the whole of the North-western frontier of British India, a direction from whence alone the British empire can be invaded by any power in sufficient force to threaten its stability.

*Geographical Position.*—The Punjaub properly speaking, comprehends those tracts of country lying between the five great rivers which run from North to South, the most westerly one being the Indus, the easterly the Sutledge. But the restless and ambitious spirit of the late celebrated Maharaja Runjeet Singh, encouraged by chiefs equally ambitious with himself, caused him to carry his arms beyond the Indus into

rocky mountainous countries, which though he overran, are anything but subdued, and are ready to a man, to rise at the first signal reverse happening to the Sikh arms. It is bounded to the East and South East by the Sutledge; to the North by the snowy range of the Himalaya, beyond which its feudatories, the Jummoo Rajas, had carried their arms; to the West by the Khybur and Solimian ranges of mountains; and to the South by the state of Sind and Bahawalpore. The whole country is of an ovoidal form, lying in a S. W. and N. E. direction, with the apex towards Shikarpore, between the latitudes of  $29^{\circ}$  and  $34^{\circ}$  N., and longitudes of  $71^{\circ}$  and  $76^{\circ}$  E. and covering about 85,000 square miles. But although this country covers a vast deal of ground, a great part of it only nominally belongs to the Sikhs. This is the case with all the hilly country N. W. of Lahore, Suckett, Munde, &c. a large portion of the hilly country west of the Indus, with the exception of Peshawar, Dera Ismael Khan and Dera Ghazee Khan, which are ruled by Sikh governors; viz. the country to the North and West of Durbund, all the country south of the Teere or Khybur range, comprehending Cohat, Khuttuk, Kalabagh, &c.

*Physical aspect of the Country.*—The Punjab is an extensive flat plain with mountains to the North and West, and open to the South and East, and traversed by five magnificent rivers, the Sutledge, Ravee, Chinaub, Jehlum, and Indus, the fertilizing effects of which, protected and encouraged by a mild and powerful Government, will some day render it one of the finest countries in India. At the present moment, the vast plain presents nothing but a waste, comparatively speaking, with here and there cultivation. Even in the neighbourhood of the very capital itself we meet with extensive jungles, the luxuriance of their rank vegetation shewing what the country could be made. But of all people in India, there are probably none so badly adapted for the plough as the Sikhs; and the other inhabitants of the Punjab form, comparatively speaking, but a small population for this extensive country. There is nothing, however, which strikes the traveller so much as the scanty population\* of the Punjab, when compared with the well populated country included under the protected states. Proceeding from Lahore to Julapore, via Kori, Meraliwallah, Allipore, Ramnuggur, Mangut, &c.

\* The greater part of the Mussulman agricultural population of the Punjab are Juts, a class of Hindkoos.

we pass over vast uncultivated tracts, with here and there in the centre of the bushy jungle a small village, with some rich cultivated fields around; now and then breaking up the monotony of the flat plain, we meet with the hillocks marking the sites of towns and villages which are now no more; but of which the streets and houses have left this memento of their former existence; or deep ravines, the haunts of the wolf and the jackal. Bands of sand traverse the country in a N. and S. direction, which point out the old beds of rivers, and prove that all of them have been changed. Thus the Sutledge, which formerly ran close to the town of Loodianah, is now seven miles to the northward; the Ravee which twenty years ago washed the walls of the city of Lahore, runs in a channel three miles off to the northward; the Chunab which ten or twelve years ago ran close to the town of Ramnuggur, is now four miles distant; and the same applies to the Jehlum. These changes also are striking in the Indus, where it leaves its mountain channel at Kalabagh. Kunkur, a compact marl, formed no doubt from the deposition of springs that formerly existed, is frequently to be found, forming beds, &c. in the clayey soil. But till we reach Jalalpore, we do not meet with any other rock in situ.

*Soils.*—The soil varies in a remarkable degree from stiff clay to sand, mixed with each other in variable proportions and with vegetable matter. Between Jalalpore and Pind Dadur Khan, it consists of a black rich loam, and is probably the finest we saw in the Punjaub. Mixed up with the soils, carbonate and sulphate of soda are frequently met with, and if in quantity the land is not worth cultivating. Several large tracts are in this manner rendered barren, particularly on the West side of the Indus in proceeding to Peshawur.

*Salt Range.*—From Jalalpore, the salt range extends in a N. W. by W. direction on to Maree on the Indus, when it crosses the river, and can be traced from thence onwards to the Khybur or Teera mountains. From it various secondary branches proceed, as one to the N., where it is met with in the neighbourhood of Rotas, and on which the fort of that name is built, forming the Tillah hills of Elphinstone; it extends for a short distance Northward, and probably then makes a bend to the Eastward. All these ranges join the low group of hills to the North-east, but none of them cross the Jelum below the town of Jelum. These, however, cross there and run on by Bimber, Jummoo, Nurpoor,

and down by the South of Belaspore, crossing the Jumna, at Fyzabad, and the Ganges at Hurdwar.\* The whole course from Jelum is as near South-east as possible, like all the other secondary ranges of the Himalayas.† The salt range is parallel to the central or high mountain range.

*Rocks.*—The rocks met with at Jelalpore, consist of

1. Limestone,
2. Sandstone,
3. Sandstone Conglomerate,
4. Red and green Marls,
5. Gypsum,
6. Conglomerate.

*Conglomerate.*—Resting upon the five rocks mentioned, in an unconformable position, there is a conglomerate, held together partly by calcareous and partly by siliceous matter; in it occur rounded masses or boulders of granite, syenite, trap, quartz rock and limestone, &c., the last of which abounds with organic remains. We meet with this rock in situ some miles to the Westward, and on the road leading to Kalabágh, as well as at that place, it points out the direction followed by the stream which deposited the conglomerate.

*Limestone.*—It is very compact, and varies in colour from greyish white to greyish black; it is devoid of organic remains, and forms the highest parts of the mountains, rising to a height of about 1500 feet above the river Jehlum.

*Sandstone Conglomerate.*—The town of Jelalpore is built on the inclined sandstone conglomerate strata, and principally of that rock. It has a very pretty appearance, the houses being neatly arranged in a niche of the mountains, and about sixty feet up the acclivity, the name dates back to the time of Jehangeer, at which period it was large and populous; the ruins, now seen about two hundred feet above the present site, testify to the accuracy of the statement. It was destroyed by Runjeet Singh about the commencement of his career, it being then principally inhabited by Mussulmans. Hindoos now form the bulk of the population. On the hill overlooking it, are the ruins of an old fort, which appears to have been almost entirely built of boulders.

\* Journal of the Asiatic Society.

† Elphinstone's Caubul, vol. II. p. 407.



All the rocks, with the exception of the conglomerate mentioned, are highly inclined, the angle varying from  $35^{\circ}$  to  $60^{\circ}$ ; there is no uniform direction, as they dip N. E. and W.; nor is there any plutonian rock seen to account for this extraordinary arrangement.

*Gypsum—Economical Uses.*—The gypsum occurs imbedded in the red and green marls, its color being either white, rose or brick red; from this place to the river, which is only distant half coss, masses of any size might be carried, and it is found here equal to the finest gypseous alabaster of the European continent; it is of this substance that the beautiful groups of small white figures and vases imported from Italy are made. The celebrated plaster of Paris is procured by exposing this rock to heat, which deprives it of its water of crystallization, it then falls to the state of a white powder, which has a strong affinity for water. Captain Franklin speaking about this rock, as found among the Himalayas, says, "It is probable that its chief use in Bengal for some time, would be as convertible into plaster of Paris, and affording a material for cornices and ornamental work, to the banishment of the very rude productions of this kind that we have hitherto put up with." There is *perhaps a sufficient quantity of it* to answer any demand likely immediately to arise. When the Government House was last repaired, it was considered desirable to obtain a sufficiency for the purpose above-mentioned; but the fact of its occurrence within our own mountain provinces was not known at that time; *as it is within fifty or sixty miles of water carriage, it might be expected to pay for its transport.* In addition to its value in the arts, it forms an excellent manure, and could be applied with great advantage to many of the soils in the Punjab. To the native its uses are quite unknown; but when it is appreciated, or rather when the country falls into the hands of a Government which knows its value, we may venture to predict, from its occurring in such vast quantity close to the banks of the river, that it will form a valuable article of exportation to Bombay, &c. or even now, as by the excellent arrangements made with the Lahore Government by Mr. Clerk, it is not liable to duty. To the Bombay Government therefore the gypsum is well worthy of attention, seeing that it might be most advantageously used in the public buildings, in making the ornamental works, and for many other purposes; and it would, as Captain Franklin remarks, afford the proper material for making cornices to the exclu-

sion of the rude articles now in use. The experiment is well worthy of a trial, whether executed by Government or by private means; if by the latter, and encouraged, it would no doubt yield a good return.

Proceeding along the hills in a W. by N. direction, we reached the village of Aaganwallah, distant about four coss. The inhabitants are principally Awans;\* we ought rather to say *were*, seeing that it is almost entirely deserted, owing to the rapacity of Raja Goolab Singh's soldiery. To reach the village we proceeded up the banks of a small ravine, and as we approached its vicinity, we found the road all paved with rounded boulders, which are strewn over the whole country. On the hill above them is a fort garrisoned by 200 of the Jummoo troops.

Gypsum in enormous beds of 13 feet in thickness and upwards is here met with; and associated with it, the pure crystalline variety, named selenite.

*Jutaneh Salt Mines.*—A few miles further to the W. and by N. is the village of Kewal, where we pitched our camp, and proceeded to examine the salt mine of Jutaneh, distant about 4 coss. The road lies along the base of the mountains, and abounds with ravines. On the acclivity is seen the pretty village of that name, surrounded by palm trees; it is the residence of the miners, and contains about two hundred inhabitants. The mines, however, are about two miles further on, but beyond this all the water is either salt or brackish, and to reach them, we proceeded up the bed of a small nullah, by the action of the stream of which the strata have been well exposed. The mines, three in number, are about 45 feet above the bed of the stream, and have been opened 20, 30 and 35 years respectively; the shafts are about six feet in height and three in breadth, varying in length from 140 to 180 yards, and sunk through the red marl, in which rock the rock salt occurs imbedded. It also contains large imbedded masses of gypsum, which in many places are highly polished by the mere friction of the miners' bodies in passing and repassing. The descent is down a gradually inclined plane till we reach the principal bed, when we descend into the body of the mine by steps cut in the salt. Before arriving at the principal bed of

\* The Awans, according to Elphinstone, belong to the class of Hindkees; they form nearly the whole population of the country on the East side of the Indus to the South of Attock. Some part of the country is occupied by the Khuttuks and Bauricks.

salt, however, we pass several smaller ones, varying from three to six feet in thickness; the largest, the one now worked, is from 170 to 200 feet.

*Mines.*—The dress of the miner consists of a small piece of dirty white cotton cloth wrapped round the middle of the body, a similar piece round the head; and to protect his shins from the splinters of rock salt, a thick pad of black woollen cloth is worn. His tools are few in number and of a simple nature; viz. a large hammer, sharp-pointed at one end and flattened at the other, chisels and handspike; with these, he removes masses varying in weight from three to four pukka maunds (240 to 320 lbs.), two of which are a camel load. Smaller masses are also removed to load oxen, &c. In removing the large masses accidents, owing to the narrowness of the shafts, frequently occur. To light up the mine, small oil lamps are used, appended to which are long hooks, in order to fasten them to any projecting piece of rock salt. The miner is capable of removing from situ eight pukka maunds per diem, for which he receives an anna per maund, but he supplies himself with tools and oil, which cost four annas. On carrying the salt out of the mine, an additional two annas is given; this however is the work of another individual, who is capable of removing sixteen maunds per diem. By camels, bullocks, &c. the salt is conveyed to Pind Dadur Khan, (as no salt is allowed to be sold at the mines,) and there sold at the rate of a rupee the pukka maund. When the Maharajah Runjeet Singh held the mines in his own hands, a rupee was charged for a camel load; but prior to farming them out to the Jammoo Rajas, he had raised the price to 2 rupees. Now the price of a camel load varies from 6 to 8 rupees, and before reaching Ambala, paying hire, duty, &c., it costs from 8 to 20 rupees.

The salt is sold in the bazar at the rate of from 13 to 15 seers per rupee.

The mines are guarded by a party of the Raja's hill troops: In the central division of the town of Pind Dadur Khan, (it being divided into three,) which contains about 10,000 inhabitants, there is a mud fort also garrisoned by a battalion of their troops, with some horse artillery; facing it, there is a wide plain on which the salt was lying in great quantity; here also scales are erected for weighing it prior to loading the camels, of which there were about 70 or 80 present.

*Koura Mine.*—Further to the westward is the largest mine; viz. that of Koura, so named from a village of that name; it is four coss from Pind Dadur Khan, and the route to it is similar to that which leads to the other mines, up the bed of a mountain torrent, containing but little water, its banks however were in many places covered with efflorescence of salt, resembling much from its pure white color, snow that had newly fallen. The village of Koura built on the acclivity of a small hill is close to the mine, and contains about 250 inhabitants. Here we were met by some of Raja Goolaub Singh's people. The shaft is similar to those already described, but of a greater length, being not less than 300 yards. On sinking it, much practical knowledge has been evinced; thus, in the gallery we frequently pass beds of ten and twelve feet in thickness, these, however, have been cut through, and left untouched, and the shaft carried on to the great deposit; but how the individual who first opened the mine was led to conclude that a large bed of salt existed beyond the smaller ones, (it being so contrary to the native character to risk capital if a means of repaying him with interest, for that he has already laid out, is presented, which undoubtedly the beds mentioned would have done;) whether by the out-cropping of the salt in another part of the hills, from mining operations carried on in some other place, or from geological reasoning, we could not ascertain. Even as to the definite time when the mines were opened, we could not get any information, further than that it was during the time of the emperors. On entering the mine all the natives took off their shoes, and proceeded barefooted. After we had gone down the gently inclined plane some two hundred yards, the air became very oppressive; to descend into the great cavities we found a similar arrangement of steps cut in the solid rock salt, but the sight presented here was truly magnificent, far surpassing any geological exhibition that we had ever witnessed, and well repaid us for our suffocating trip. By the innumerable lamps the mine was well lighted up, which being reflected by the beautiful crystalline walls, formed a splendid and brilliant hall of about three hundred feet in circumference by fifty in height, contrasting well with a deep dark abyss, to the end of which the eye could not penetrate, formed by an old abandoned shaft which water had inundated. Adjoining to this, there are several others in a similar state. The thickness of the principal bed could not



be ascertained, as it occupies the whole extent of the mine, but it is upwards of several hundred feet.

*Characters of the Rock Salt.*—The rock salt in colour varies from white to flesh or brick red, granular, the concretions being very large and very compact, so much so, that various ornamental articles are cut out of it. I was presented with a series of small vessels of it, which were highly polished; in pieces of about an inch in thickness it is transparent or semi-transparent; it occasionally assumes the stalactitic form, several stalactites of a pure white colour, and more than a foot long were brought to me. This salt is extensively used throughout India, and is so pure as only to require grinding.

At 8 A. M. the thermometer stood in the shade at  $45^{\circ}$ , in the mine at  $82^{\circ}$ ; but owing to the particular state of the air, it appeared to be much more; to health it is most prejudicial; the natives informed me that all of them suffer severely, after working a few years, from affections of the chest, so much so, that the average period of life with them does not average more than from thirty-five to forty years; all presented a most sickly appearance, similar to that which we observed in individuals living near to marshy districts in the Pinjore valley.

*Relations of the Strata.*—The relative position which the strata bear to each other, is well seen in the section formed by the bed of the nullah. Here we have a red compact sandstone forming the fundamental rocks, and inclining at an angle of from  $35^{\circ}$  to  $55^{\circ}$ ; resting upon it we find the red marl in which the rock salt occurs imbedded. Gypsum does not occur in beds, but imbedded masses in the marl. In color the marl is red, green, greyish white, &c. Forming the superincumbent rock there is a breccia, consisting of red sandstone, marl, gypsum, and limestone, held together by calcareous matter, and resting in an unconformable position, as the rock at Jelalpoore, and like it the limestone boulders contain organic remains, and in such quantity do they occur as to lead to the supposition, that it has been almost entirely, though not exclusively, formed through the agency of the fossil animals. Since the brilliant discoveries of Ehrenberg with the microscope, which have brought to light a new world of animals, the old dogma, *omnis calx e vermibus*; *omnis silex e vermibus*; *omnis ferrum e vermibus*, has been again revived; the size of these animals is sometimes so very minute, that Ehrenberg has proved that a million

may occur in a cubic inch of chalk. But it has been proved that the organic matter does not always bear the same proportion in chalk from different quarters; thus in specimens from the North of Europe, the quantity of inorganic earthy chalk exceeds that of the organic bodies; but in specimens from the South of Europe, the animal remains largely predominate. Ehrenberg in his work on the animalcular constitution of chalk, describes and figures specimens from twelve localities in Europe, Asia, and Africa, all of which are filled with foraminiferous and other minute chambered shells; the number of species amounting to 81, some calcareous and some siliceous, including twenty-two species of microscopic nautilites, nummulites, and cyprides, and forty species of infusori; with these there are a few confervæ and other minute vegetables.\* That the calcareous matter which invests the exuviae of molluscous and radiated animals found in the limestone above-mentioned, as also in a nummulitic limestone which we shall afterwards notice as occurring among the Himalayas, the limestone of Caraberg, the muschelkalk of the continent of Europe, the nummulitic limestone of Hussun Abdal, the encrinal and coral limestone of the silurian and carboniferous systems, is a segregation, (as supposed by Buckland and Jameson,) from the waters in which these were deposited, and not formed by the animals themselves, is more than probable.

As we ascend the Pass leading into the salt range which lies four coss to the N. W. from Pind Dadur Khan we cross over a range of limestone abounding with organic remains, similar to those met on the boulders; in height it is about 500 feet, very rugged and steep, and two miles in length. At the summit is the village of Chout, we then get into a large and well cultivated valley, through which our route lay six miles, and cross a small hill of fossiliferous limestone, in which a thick bed of brown iron ore or hematite occurs imbedded, and from Ehrenberg's researches we are entitled to infer, that in it organic remains will be found. Descending a gentle acclivity, we arrive at the small but pretty village of Choia Sydun Shah; from whence the road to Rotas winds along the banks of a small stream, whose water is supplied by a large spring in the centre of the town. Its inhabitants are mostly all fukeers, and it is so celebrated for its sanctity by the Hindoos, as to

\* Buckland; Edinb. New Phil. Journ. vol. XXI. p. 441.

cause them to bring the bodies of their relations here, for fifty miles round, in order to burn them. When we were there, there were several burning, and the ashes of others collected in heaps. Of Maharaja Runjeet Singh, who has built a large house, it was a favorite resort, and there was one building for the Jummoo Rajas, (Dhian Singh and Goolaub Singh.) The building material is limestone, the rock of the district. On it in the neighbourhood of Rotas there is a coating of calcareous sinter and tuffa,\* fifteen feet or more in thickness, shewing that springs (they bring spring deposits,) were formerly more abundant than they now are. They, as well as the limestone, are extensively used for building purposes, and for making lime.

*Springs.*—The springs, like all the other springs in the Punjaub and Affghanistan,† which issue from limestone districts, belong to that division which is hot in winter and cold in summer; the temperature of the air in the morning being twenty degrees lower than that of the water. Similar springs were met with among the Himalayas, in the Bijouni valley, between Saeeki Huttee and Belaspore, Cohat, Hus-sun Abdul, &c. The depth of the one at Rotas is said to be unknown. Regarding it there is a tradition which I was told by one of the natives, viz. that a man who had been engaged making a rope for twelve years attempted with it to fathom it, but could not find any bottom. Opposite the spring a *shamianah* is erected, and beneath it a *charpoi*, covered with a white sheet; here a *Grunth*, (the sacred book of the Sikhs,) is placed, and before it sits a man night and day with a punka in his hand, to drive away flies, repeating passages from the sacred volume.

From Rotas on to Maree on the Indus the whole country consists of extensive plains surrounded by mountains, in general barren in the extreme. It is in these that the best horses of the Punjaub are bred, but that does not infer much, as a very good country bred horse is seldom seen.

\* Probably this is the rock alluded to by my friend Mr. Griffith in his report on the subjects connected with Affghanistan, when mentioning the sources of springs he says, "The bed of the ravine by which the army descended from Lala Ghurree Beg, was found to be dry to within one mile of Ali Musjid, at a place called Siri Chushma, where there are copious supplies from a soil of cavernous limestone. Indeed, this rock seems to be the principal source of the springs of the country in those parts beyond the influence of the melting of the perpetual snows." *Journal Asiatic Society*, new series, No. 34, page 809.

† See Reports by Lord, Burnes, Griffith, &c.

The higher and mountainous parts of the country are composed of limestone and red marl, and the plains, when an outcrop is seen, of sandstone and conglomerate, the former being sometimes of a green color, and but little inclined. At Kullur Kahar, the conglomerate is unconformable to the other rocks, and in its character differs from that rock at Jelalpore, in the limestone containing no organic remains. Proceeding onwards W. N. W., we cross many mountain streams or nullas, all of them in general receiving the name of Soane, owing to the sand on their banks containing gold, for which it is extensively washed during every month of the year; that of December, January, and February excepted. The gold obtained is similar to that found on the banks of the Indus. From Muzan to Maree the country is still open, till within three coss of the latter, when the mountains contract, forming a narrow defile, the saliferous rocks on either side rising to a height of two and three hundred feet. As we approach near the banks of the river, the country is covered with boulders of trap, granite, syenite, hornstone, porphyry, &c.

*Maree and Kalabágh.*—Of all geological sites in India, there are probably none more interesting or important than that comprehended under Maree and Kalabágh, the former on the East, the latter on the West side of the river Indus, and distant from each other about half coss; interesting for the nature, position, and organic remains which the rocks contain; and important from its mineralogical riches.

*Rocks.*—1. Magnesian Limestone.

2. New red Sandstone.

3. Fossiliferous Limestone.

4. Red Marl and Sandstone, with

i. Coal and Mineral Sulphur.

ii. Rock Salt.

iii. Gypsum.

iv. Brown and red Iron Ore.

v. Alum Slate.

The oldest rock met with is the magnesian limestone, which varies in color from pale grey to dark blue; fracture more or less conchoidal, with an earthy aspect; hornstone occurs in it in layers or imbedded masses. The lower beds are destitute of organic remains, but the upper abound in them; the most common fossils being marine shells belonging to the genera *producti*, *spirifer*, *gryphaea*, *nautilus*, &c.



Imbedded in it there are also enormous masses of red and brown iron ore or hematite, which resisting the action of the weather better than the limestone, stand out in bold relief. In many places the needle of the compass is rendered quite useless, even at a considerable distance from the rocks, owing to their being highly magnetic from the quantity of iron which they contain. Resting upon the limestone, we have sandstone, varying in colour from greyish white to dark reddish brown ; in some places so soft as to crumble under the finger ; in others so hard as to give sparks with steel. The compact dark variety whose colour is owing to the peroxide of iron, abounds with teeth, bones, and coprolites of enormous animals, judging from the size of the first ; but whether they belong to saurians or sauroid fishes, we have not been able to determine from the imperfect nature of the specimens, but probably to the latter. In Cutch, a caudal vertebra, said by Messrs. Clift and Owen to belong to a saurian has been found in strata, which appear to belong to the lias or oolite period.\* We broke up enormous slabs of red sandstone studded with teeth, some of whose summits were quite flat, being worn down, shewing that the animal to which they belonged had far advanced in years. In the coprolites, teeth and scales occur, pointing out that their habits were carnivorous. In England, in this formation, the remains of two saurian genera palæosaurus and thecodontosaurus have been found,† and they are the most ancient examples of fossil reptiles yet found in the British islands. In their organization, they are allied to the iguana and monitor. In Germany, saurians have been met with in the zechstein limestone, which is the oldest rock on the continent in which these remains have been found ; they belong to the genera protosaurus, also allied to the monitors. It is, however, remarkable that the sandstone in which the organic remains occur at Kalabágh is deeply coloured with the peroxide of iron, and it is a well known fact, that scarcely any are ever found in rocks where this metal is found to abound ; thus we often find red and white sandstones alternating with each other, but only the latter containing organic remains ; and in England and Scotland it is the grey and calcareous beds. Some exceptions to this rule are met with as in Forfarshire, and Lord Greenock we think, found fossil teeth and coprolites in a red sandstone in East Lothian.

\* Grant's Trans. Geological Society, 11. Sec. Vol. V.

† See Proc. Geological Society, No. 45, Messrs. Riley and Stuchbury, as quoted by Lyell.

Resting upon the red sandstone we have the red marl in which the rock salt and gypsum occur imbedded. Its colour, as in other quarters mentioned, varies exceedingly, being red, white, blue, green, &c. The rock salt occurs in vast beds of several hundred feet in thickness, exposed and close to the edge of the river, so that when it rises, owing to the hot season causing the melting of the snow in the mountainous regions to the N. and N. N. W., it uniformly washes away a part of the salt; its color is generally red, approaching to rose red, but sometimes white; structure lamellated, but very compact. The gypsum associated with it is either of a rose red, or greyish white colour, and of a granular structure. Like the rock salt, it occurs forming mountains of considerable height; in some places we find it studded with crystals of rock crystal, the colour varying in general with the rock; the most beautiful varieties are the rose red, but they also occur white, grey, brick red, black, &c., varying from transparent on the edges to semitransparent, translucent and opaque; in form generally the six-sided prism terminated by the double six-sided pyramid, but with numerous modifications of the terminal planes, and sometimes the lateral planes are wanting altogether, when we have formed the double six-sided pyramid. In other crystals one of the lateral planes will be large at the expense of all the other five, which are only represented in miniature, but the forms are much too varied to attempt to notice them all. In size they vary from that of millet seed to two or three inches. The resplendent appearance presented by the gypsum when the sun is shining, produced by these imbedded crystals, is very striking. The occurrence of rock crystal in this locality is both very extraordinary and exceedingly interesting, and this is the only one that we are aware of in which silica in a pure state is thus associated with sulphate of lime. In the carbonate of lime or limestone, it is met with, but even in this locality it is rare. The crystals are of contemporaneous formation with the gypsum, and probably have been formed by segregation of silica from that rock. In the rock salt, though much more rarely, crystals are also found imbedded.

Associated with the red marl there is a *white sandstone* in which coal along with *mineral* sulphur occurs. To examine its value and adaptation to economical purposes, particularly steam vessels, was one of the principal objects of my journey to this place. The late lamented travellers, Burnes and Wood, had each reported, I believe, to Govern-

ment, and pointed out that this district would yield coal in sufficient quantity to supply the demand ; if, however, any attention had been paid to the geological structure of the country by them, they could have at once declared that no coal of value or worth working would be found.

Some months prior to undertaking the journey, a series of papers regarding the coal of Kalabágh was put into my hands by Mr. G. Clerk, Governor General's Agent, requesting me to give my opinion as to the probability of coal being found in the district of Kalabágh in any quantity. After perusing the papers, I answered in the negative, unless it was found that the true coal formation, or carboniferous system, dipped under the saliferous system, out-croppings of which might be found containing beds of coal. Such, however, is not the case. But one of the enterprising officers mentioned, has even gone further, and asserted, that "were the salt range, East of the Indus examined by a geologist, there is ample reason to believe, that discoveries of value to Government would be the result," alluding to the discovery of coal. In a private letter to the address of Mr. G. Clerk, an extract of which has been published in the Asiatic Society's Journal, we mentioned the existence of coal, probably the same as found by Burnes\* and Wood ; it is not true bituminous coal, and had they examined the localities in which it was found, and the district, they would, had they been at all conversant with geology, have come to the conclusion, that the Kalabágh district would not yield coal in sufficient quantity fit to be used for economical purposes. In no place has *bituminous* coal ever been met with worth working above the magnesian limestone. Statements have been made to this effect, but when properly examined, have invariably been found to be incorrect. In the letter above quoted, dated 15th November, 1841, we state, that the coal met with at Kalabágh occurs in thin seams in a white sandstone that alternates with the red marls in which the rock salt and gypsum are imbedded. The largest seam is, in breadth about seventeen inches, consisting partly of coal, sandstone, and mineral sulphur. The coal met with is partly brown coal and lignite, and partly

\* Specimens of supposed coal were transmitted to the late Secretary of the Asiatic Society in 1832, from Luchee, Kurpa, &c. On examination he found, that they were nothing but bituminous slate. How such an error could have been committed in forwarding such specimens, is very extraordinary.

jet and not true bituminous coal; but well adapted, from the experiments which we made on a small scale, for steam purposes, burning with much flame, emitting much gas, and at the same time leaving but a small quantity of earthy matter or ashes.\* Probably, however, they were led into error, which even in Britain sometimes happens, by confounding the alum slate, which is of a greyish black colour, and is associated with the white sandstone in which the seams of coal occur. This is not at all improbable, as the colour of the alum slate is so very dark, and so apt to deceive the eye of the traveller; the colour too, is owing to bituminous matter. The use of coal as a fuel is unknown to the natives, being used by them as a medicine in various diseases, and is so much prized as to have led them to suppose, that a large sum would be given for it. From the different seams, about two thousand maunds had been collected and brought to the town of Kalabágh, where it was stored up by a number of individuals, in quantities of from 10 to 100 maunds, for which they expected to get 4 rupees per pukka maund=£ 64.

Resting upon the red sandstone, we meet with a limestone abounding with fossil organic remains; it occupies the same position as the muschelkalk, a formation which has only been properly identified in France and Germany. Murchison has no doubt pointed out certain beds in England as its equivalent, as in them he has found many organic remains, which are also found in the muschelkalk or shell limestone. Such characters deserve the highest consideration; but on the other hand, if in another quarter of the world a limestone is found with organic remains, differing from those met with in a rock holding the same geological position in Europe, are we from this character to infer that these rocks are of different ages? If we do this, we are taking for granted, that at the time of the deposition of the saliferous system, the laws which regulate the distribution of the organic kingdom, operated simultaneously throughout the globe. If we look at the organic world of the present day, and trace out its distribution, we find that in each continent, we have a particular series of animals and plants peculiar to it. Thus for instance, let us first examine the mammalogical kingdom. To how many genera does this remark not apply?

\* Journal of the Asiatic Society, 2d Series, No. 37, p. 2.



Thus in America, we have the genera *Cebus*, *Iacchus*, *Procyon*, *Cercoleptes*, *Didelphis*, *Condylura*, *Icalops*, *Auchenia*, *Myrmicophaga*, *Cavia*, &c. In Australasia: *Echidna*, *Thylacynus*, *Dasyurus*, *Pera-meles*, *Ornithorynchus*, *Phascolarctos*, *Petaurus*, *Phascolomys*, &c. In Asia, *Galeopethicus*, *Dysopes*, *Ailurus*, *Artictes*, *Paradoxurus*, *Moschus*, &c. Peculiar to Africa and Europe, we could also point out many genera. Again, if we turn our attention to the ornithological kingdom, we shall find the same remarks to apply. Thus proper to America, we find the Genera *Pipra*,\* *Rupicola*, *Phibalura*, *Casmorhynchus*, *Gymnocephalus*, *Procnias*, *Alector*, *Crax*, *Penelope*, *Dicholophus*, *Crotophaga*, *Cassicus*, *Icterus*, *Zanthornus*, *Rhamphastos*, *Rheas*, *Tanagra*. In Asia, *Calyptomena*, *Satyra*, *Tetraogallus*, *Lophophorus*, *Argus*, *Polyplectron*.

These, however, are only cited for argument, seeing that we could point out genera in every department of animated nature as peculiar to individual continents. Moreover, in the distribution of animals and plants throughout each continent, we find most striking differences depending upon the position. Thus the Zoology of Northern Asia is strikingly different from that of the Southern; the Zoology of Southern Africa, from that of Western Africa; and as we have elsewhere remarked, "as in the Botanical, so in the Zoological kingdom, we shall no doubt find a series of Birds, Quadrupeds, &c. having as their fixed places of abode certain regions of the world, beyond which, though a few may migrate, yet upon a careful examination, the greater number will be found to be confined."†

Such being the state of the distribution of the organic kingdom as now exhibited, are we entitled to infer that it, long prior to the creation of man, was subjected to laws differing from those now in action? Our knowledge regarding fossil organic remains would lead us to infer that such was not the case, though probably during the deposition of the carboniferous, saliferous, and oolitic, wealden, and in the cretaceous and older tertiary systems, the climate in northern regions was then milder than it now is, and that genera of animals and plants were there met with which are now peculiar to tropical regions. Allowing this to be the fact,

\* By Dr. Burton a species of *pipra* is said to have been found among the Himalayas. Is it not a *Parus*? See *Proc. Zool. Soc.*

† *Journal of the Asiatic Society*, No. 85, page 26.

which we must do, as the observations are based upon incontrovertible data, we are not to admit that if we find strata connected with a particular system, and occupying the same position as they do in Europe and elsewhere, and composed of the same rocks, that they, because their organic remains differ, are not of contemporaneous formation. Thus for instance in the limestone rock, which we consider as the equivalent of the muschelkalk, we meet with a coral nearly allied to the *Eunomia radiata*, a fossil met with in the oolite. Agassiz, an authority of the highest order, has asserted, that no species occur in two geological formations, or even in two different parts of one formation; and he says, that he has come to this conclusion, not only from an examination of the species of *Trigonia*, but that it has been confirmed by his examination of fossil fishes and echinodermata.\* His statement, based upon ample researches, and a profound knowledge of the subjects investigated, will go far to check that rage which now exists among geologists, of identifying species found in different parts of a formation with each other; but we agree with Brown, that there are species which pass from one subdivision of a formation to the other, and even from one formation into another. Agassiz, to throw aside all observations which have been made by his predecessors, asserts, *that no so-termed character—that is, no observable mark—can be so striking as to indicate an absolute specific distinction; but at the same time it should never be regarded so trifling as to point to absolute identity; that characters do not mark off species, but that the combined relations to the external world in all circumstances do.*† How are varieties to be distinguished? Is the influence of the relations of the external world uniform? Undoubtedly not, and as Brown says, many of the distinctions adhering to individuals are the mere result of such an influence, or in other words, Agassiz wishes to prove, that until the geognostical and geological relations are examined, the species cannot be determined, following an extreme course in opposition to those fossil geologists who maintain, that by an examination of a few fossils, they can tell the age of any deposits.

Many of the fossils met with in the limestone which we consider as the equivalent of the muschelkalk, are nearly allied to those met

\* Edinb. New Phil. Journ. No. 63, page 97.

† Edinb. New Phil. Journal, No. 63, p. 97.



with in the same formation elsewhere, but the greater number of them are distinct.

Talking of the relative ages of the salt formation, McCulloch has fallen into a most extraordinary error. Thus, he says, "This stratum (saliferous formation) abounds all over Asia; and he who desires to trace its extent, may apparently do it with safety, by examining the sandy deserts on a map; since wherever they have been described by travellers, it is invariably found that salt occurs in them. There seems no reason to doubt that all sandy deserts of the world belong to this stratum, and hence the salt pools and the brackish water that makes so conspicuous a figure in the narratives of travellers; I may name out of the many, the salt range of hills crossing the Indus at Kalabagh, and extending to Jelalpoore; the desert of salt between Tehran and Ispahan; that which extends from the Helmund river in Seistan to the range which divides that province from lower Mekran, of four hundred miles in length; and another of equal dimensions, which reaches from Koom and Kashan, to the provinces of Mazanderan and Khorassan. But the most singular tract of it is found occupying the shores of the Persian Gulph in the neighbourhood of Ormuz, not less remarkable for its immense thickness, than for its configuration and colour. It is presumed to be this deposit, from the gypsum and salt which it contains, and from its connexion with the sandy and salt deserts."\* He then goes on to trace its distribution in America and Africa, and says, that here also we shall probably form a correct conclusion in considering the sandy deserts of these quarters of the world as appertaining to the same system.† That some deserts may derive their salt from saliferous systems is not at all improbable, but nothing is more erroneous or more incorrect to suppose, that this is generally the case.‡ Thus in the great Thurr or Indian

\* Syst. of Geol. vol. ii. p. 229.

† Syst. of Geol. vol. ii. p. 230.

‡ M. Engelhard states, that there has lately been discovered in the salt mines of Hullin implements, and in such a position in regard to the beds of rock salt at present worked, as to lead to the conclusion, that deposits of salt have taken place since the commencement of the working of these mines, formed by the action of water on the previously existing beds of rock salt; and Professor Jameson remarks, that this fact is interesting in many respects, and affords a warning to geologists to be careful to distinguish between original and ancient deposits, and those of a very recent date formed by the action of water, and in an ancient formation. Edinb. New Phil. Journal, vol. xxviii. p. 420.

desert, part of which separates the Bickaneer from the Bhawalpore territory, which was crossed by Elphinstone, who has given a graphic account of it, I have been informed by that active and talented officer, Lieutenant Robinson, Agent of the Bhuttee country, that in sinking the various wells in attempting to carry a road from Delhi through Hansi and Bickaneer to Bhawalpore, he has always found the salt in layers, or beds of soil of different thickness; here water was always salt or brackish, but after boring through this bed, another would be found devoid of salt, and the water below it fresh; but it only remains so for a short time, owing to the infiltration of salt water from the upper beds, and which has thrown much difficulty in his way in carrying out his plans. In a few parts of India, do we not meet with vast salt tracts unconnected with the saliferous strata? Thus in the Tirhoot district, Ambala district, Punjaub, &c.; nor on the other hand does it follow that those tracts, which occur in the neighbourhood of the saliferous system, are salt. Thus for instance, the finest soil in the Punjaub is that found between Jelalpore and Pind Dadur Khan, and it is well known, that no soil is worse adapted to cultivation than a saliferous one, it causing large tracts to remain waste; the only use of it being to obtain salt, which is either the carbonate, sulphate, or muriate of soda; nitre too is not uncommon.

*Alum Slate.*—Next to the rock salt in economical value at Kalabágh is the alum slate, from which large quantities of alum (sulphate of alumina) is manufactured. In making it, there are fourteen manufactures engaged, with from 12 to 18 workmen in each. The alum slate which occurs in great beds alternating with the red marl, and containing beautiful twin crystals of selenite, is brought to the manufactories on donkies, at the rate of an anna per pukka maund.

*Manufacture of Alum.*—To procure alum, the following is the process adopted: first a layer of wood of about two feet in thickness is placed on the ground, above it a layer of alum slate of about the same thickness, which is sprinkled with water; the layers are continued successively for six or seven times, till the heap reaches to a height of from 25 to 30 feet; the wood is then lighted, and in the space of from 12 to 24 hours, the fire is extinguished. By this time the greyish black colour of the slate is converted into blood red. When cooled a thousand maunds of it are thrown into a brick tank, and

mixed with as much water, where it is kept for three days, or until the water has acquired a deep red colour, the water is then let off into another tank, all the clay being left behind, and from it strained into a large iron boiler, and boiled for three or four hours until the quantity is reduced to a fifth; from this boiler after being cooled, when it is said to be cutcha, and mixed with two maunds of potash, it is conducted to another boiler, and then boiled till it is ready, which is ascertained by removing a small quantity, and if it then hardens into a solid mass it is considered so; when still hot, it is placed in red clay vessels capable of holding three pukka maunds, and after crystallizing the vessels are broken off, leaving an immense round mass of solid alum; it is not, however, quite pure, being of a red colour and semi-transparent; the colour is owing to the iron which it contains. This is the case with most of the alum which we have seen in the Upper Provinces. It is sold at 19 rupees and 4 annas the camel load of 6 maunds, (equal to 384 lbs.), of which however 2 rupees and 4 annas are exacted as duty by the Mallick. After removing the clay from the vat, it still retains the bright red colour, which attracted so much the attention of Elphinstone when there in 1809, who with the eye of a traveller thus notices it: "All the earth, particularly near the town (Kalabágh) is almost blood red, and this with the strange and beautiful spectacle of the salt rocks, and the Indus flowing in a deep and clear stream through lofty mountains past this extraordinary town, presented such a scene of wonders, as is seldom to be witnessed."\* How long alum has been manufactured is uncertain, but from Elphinstone's observations, it appears to have been so, though he was ignorant of the circumstance, long before he visited the place.

*Nitre.*—It is not met with in the immediate neighborhood of Kalabágh; but the soil, from whence it is obtained, which is of a deep black colour, is procured about eight coss to the southward.

The Mallick of Kalabágh, (Ullah Yar Khan,) derives his income, amounting to Rupees 10,000 per annum, almost entirely from the mineral resources of the country. The salt trade, however, is monopolized by Raja Goolaub Sing, who only allows him to sell two boat loads, varying from 300 to 700 maunds per mensem. To the North-west but little salt is exported, as other mines in that direction occur.

\* Kingdom of Caubul, vol. i. M. Todd, page 59.

*Mundi Salt Mines.*—The similarity of the rocks met with at the salt mines in the Mundi country, North of the Sutlej, with those of Kalabágh, is too striking to pass unnoticed. The salt mines occur in a large bason, the fundamental rock of which is compact limestone (magnesian) of a blue or greyish colour, and abounding with layers of brownish black and greyish white hornstone. It rests upon a chloritic slate, which is only partially seen N. of the bason, where a broad trap dyke (greenstone,) partly compact and partly amygdaloidal cuts through them; the amygdaloidal cavities are either filled, half filled, or empty, with calcareous spar, quartz, epidote, &c. In many places the limestone is brecciated, but contains no organic remains; in others, it occurs in thin seams regularly arranged, or mixed up with each other in a confused manner, shewing, that some violent action was in operation during the time of its deposition. The hills, unlike those of Kalabágh, are covered with vegetation, rendering an examination of the relative position of the different rocks to each other intricate, particularly that of the trap to the Neptunian strata. All the rocks are highly inclined, the angle varying from  $35^{\circ}$  to  $70^{\circ}$ , and the dip W. and by N.

The marl in which the rock salt occurs varies exceedingly in colour, as at Kalabágh, being red, green, blue, white, &c. and forming hills which rise up in the form of peaks and needles to a height of three and four hundred feet. The needle-shaped formation is produced by the action of the weather, and is strikingly seen here, the rock being very soft and easily yielding to it; it is quite devoid of structure, and abounds with minute crystals of rock salt, which sparkle like diamonds.

Gypsum only occurs in small veins in the marl, and here and there we meet with drusy cavities, filled with specular iron ore, or small balls of iron pyrites, which when broken, present the radiated structure.

The mines of Darang, as those of Mundi are termed, are about 3,900 feet above the level of the sea. In 1839, these were worked, two closed and one open to the light of day. The first that we visited had been worked for three years, and was about two hundred feet in depth, one hundred and fifty of which were through red marl. To descend into it, there was a rude ladder, the steps of which were about  $2\frac{1}{2}$  feet



distant from each other, and was divided into three divisions or stages, down which we were lighted by two miners carrying pieces of pine wood, highly impregnated with turpentine, causing it to burn with great brilliancy.

*Method of working the Mines.*—In working the mines, the most rude method is adopted, the only implements used, being large sledge hammers. The salt which is very compact and imbedded in the marl, and from 50 to 100 feet in thickness, is in all directions traversed by spouts made of the plaintain tree, (the only interior works,) which are used in conducting water to any part of the mine intended to be worked; it by degrees wears away a portion of the salt, and allows the miner to get at the remainder, which he breaks up with his large hammer. This is also the plan followed in working the mine open to day, (quarry,) the water being brought from a distance of about a mile. On enquiring if the water was kept, I was answered with a look of surprise, in the negative; it, from the latter mine, being carried by a winding stream to the Beyah. The salt is granular and very impure, containing a large per centage of iron and earthy matter. After working a mine for some time, they are obliged, owing to the quantity of water, to abandon it, and open one in another quarter, which owing to the softness of the marl rock, is easily done. Many mines were pointed out to us, which had, for the above reason, been lately abandoned.

This rude method of saving implements and manual labor, is unknown in Europe. In the Austrian mines, where the salt is very impure and invariably mixed with much clay, large chambers are formed in them, and filled with fresh water from the surface, which, attacking the sides and roof dissolves the salt, and leaves the clay and extraneous matter to settle at the bottom; after ten days or a fortnight, when the solution becomes sufficiently saturated, the brine is run off to the evaporating houses, and another supply of fresh water admitted; and this is repeated thirty or forty times, till the chambers become so extensive as to endanger the roof, and threaten destruction to the interior works. If this method was adopted at Mundi, which could be easily done, we would have salt equal, or rather superior, to that obtained at the Punjab salt mines.

*Method of removing Salt from the Mines.*—In removing salt from the first mine, eight women and a boy were employed, who carried on each

visit two cutcha maunds, (64 lb,) to the godown, distant about half mile, and each individual removes from twelve to fourteen loads per diem. The salt is carried in conical-shaped baskets, the summit of the cone being downwards, so that when depositing it, all they do, is to bend the body forward, and allow it to tumble over their heads. Altogether engaged with the mines, there were 250 individuals, 200 of whom receive four rupees per mensem; the remaining fifty from rupees five to rupees fifteen, which brings up the expense of working the mines to rupees 2,000 per mensem. The sum drawn varies from 3 to 5,000, and the average per annum from rupees 35 to 60,000. The salt is sold at the rate of two maunds = £ 160 the rupee. A Paharee carries to Mundi, which is about twelve miles distant, 26 seers, 52 lb, for which he receives two annas, or a third of its value. One half of the men are engaged at the mines, the other in exporting the salt to Mundi, Belaspore, &c.; but as its quality is so very inferior, but little is exported to the plains. It is occasionally brought down to Moubarickpore through Simla. There is another salt mine about fourteen coss to the northward, it yields, however, but a small quantity; viz. fifty maunds. Those of Durung yielding 300 maunds per diem.

In the cold weather, the miner works from 8 A. M. to 4 P. M., but in the morning they complain much of the cold, their only covering being a dirty piece of cotton cloth, similar to that worn by the miners in the Punjaub mines. Nearly the whole of the inhabitants of Durung are engaged in the mines,\* a few only cultivating the fields around.†

\* By mistake the name of Vingul has been applied in some maps to the mines; the village of that name is about three coss off.

† To health, the employment of the miner here is equally injurious as at Jutaneh, &c., and the causes why it is so, opens up a wide field of investigation. Prior to the Niger Expedition leaving England, the subject of malaria attracted much attention. Dr. Daniel in a lecture delivered to the Royal Institution maintained, that the dreaded malaria, as also the deadly stinking miasma of Africa, producing languor, nausea, disgust, and death, is owing to sulphuretted hydrogen. The jungle fever of India, is also ascribed to the same cause. On the Coast of Africa, the presence of the sulphuretted hydrogen is owing to the action and reaction of the vegetable matter carried down by the tropical rivers, and the sulphates always more or less present in the sea water. This, he proves to be the case experimentally. It is well known that the soils of the jungles of India abound with sulphates of soda and magnesia, must not therefore, he says, quantities of sulphuretted hydrogen be generated? Can science indicate a remedy for this evil? This the Professor answers in the affirmative; viz; fumigation with chlorine, by which a chemical action is instantly produced. Sulphur being thrown



All the rocks, as already mentioned, at Durung, like those of Kalabagh, are highly inclined, but they differ from each other in several essential points, though they, on the other hand, have many things in common. Thus the limestone and marl are mineralogically the same in every character; but in the former no organic remains are met with. Gypsum occurs in great abundance at the latter, and in small quantity in the former, where we have a chlorite slate and trap associated with the neptunian rocks, and with the marl there is a bed of bituminous marl slate, devoid also of fossils; and the alum slate is wanting. The form in which the salt too occurs is different; in the former in the form of a basin or hollow surrounded on all sides by older rocks, and in the latter forming strata with the surrounding rocks. The following Table, No. I, will illustrate the two formations :—

down, hydrochloric acid formed, and malaria and miasma destroyed. The Admiralty admitting the justness of Daniel's conclusions, has furnished the Expedition with chlorine, and no ship hereafter will proceed to that station without this purifier. Jameson's Phil. Journ. vol. 31, page 181.—It is a subject well worthy of the attention of the Indian Government. How often are the lives of soldiers proceeding through that malarious district, the Sunderhunds, destroyed by the effects of the miasma. In future no troops ought to be sent by water without having so much chlorine on board. It is also important to know, as has been proved by the experiments of M M. Melloni and Pazen, that a lighted cigar will in part counteract the bad effects of sulphuretted hydrogen when it exists in the atmosphere, a chemical action taking place, the products being sulphurous acid, water, and a few traces of sulphur. Phil. Journ. vol. 33, page 33.—Bischof in a letter addressed to the Friend of Africa, is inclined to call in question Daniel's statement as to the poisonous or miasmatic matter deriving its bad effects from the presence of sulphuretted hydrogen, but agrees with him in the advantages to be derived from the use of chlorine. Ed. Phil. Journ. vol. 33, page 32.—The cigar has been long appreciated in India by individuals travelling through jungly districts, but its value has only of late been proved experimentally.

## No. I.

*Saltiferous System as represented in the Salt Range of the Punjab and at Durung in Mudi, among the Himalayas, North of the Sutledge.*

1.—Saltiferous System in the Punjab Salt Range.					2.—Saltiferous system at Durung in Mudi.				
Subdivisions	Lithological characters.	Organic remains.	Localities.		Subdivisions.	Lithological characters.	Organic remains.	Localities.	
5. Alum slate, ..	Earthy slate contains sulphate of alumina.	None, .. ..	Carabagh.		Bituminous marl slate,	Granular bituminous slate, .. ..	None, .. ..	Durung.	
4. Red marl, ....	Marl and sandstone of various colors, with imbedded rock salt, gypsum, coal, and mineral sulphur, .	None, .. ..	Jelapore, Karabagh, Buekrala, &c.		Red marl, ..	Marl of various colours, containing thin veins of gypsum, and great beds of rock salt,	None, .. ..	Durung.	
3. Fossiliferous limestone ; muschellkalk, ..	Granular or compact limestone, .	Eunomia, &c..	Carabagh.		None, .. ..	....	..	..	
2. New red sandstone, ....	Red or grey sandstone, .. ..	Bones, teeth and coprolites of Saurians?	Jelapore, Jutanah, Karabagh, &c.		None, .. ..	....	..	..	
1. Magnesian limestone,	Compact grey or blue limestone, with imbedded hornstone, red & brown iron ore, .	Upper beds producta spirifer, gryphaea, nautilus, &c. ..	Jelapore, Kotas, Carabagh, Cohat, &c. ....		Magnesian limestone,	Compact grey or blue limestone, brecciated, with imbedded hornstone, .. ..	None, .. ..	Durung.	
					Chloritic slate,	Granular slate composed principally of chlorite,	None, .. ..	Durung.	
Saltiferous system.				6.	Saltiferous system.				

*Revenue.*—The revenue yielded by the Durung mines is small when compared with that of Pind Dadur Khan and Kalabágh, nor is there any chance of the former being much increased, owing to the nature of the salt, and the inaccessibility of the route for beasts of burden. On the other hand, the latter will ere long assume a very different appearance. From Raja Goolaub Singh's people, who monopolizes not only the whole of the salt trade, but governs the greater part of the hilly country W. of the Jehlum, we could not get any definite information regarding the annual revenue yielded; we believe that it is not far short of fourteen lakhs. The time, however, is not far distant, we trust, that when the country comes under the rule of a liberal and enlightened Government, (which would be a subject of congratulation to the whole agricultural and commercial population,) to see it increased tenfold. The salt will not only supply the whole of Western India, but probably may be exported with advantage from Bombay, &c. The alum can be manufactured in any quantity, and it only requires encouragement and protection to increase this article equally with the salt. On the value of the gypsum, we have already commented. When a change therefore takes place in the government of this country, we shall no doubt see the town of Kalabágh raised to one of the most important in the Punjab, although no coal has, nor shall be found worth working; but still we shall soon see another power brought into action in propelling vessels, which will do away with altogether the use of fuel; viz. electro-magnetism. Such being the case, we trust not but that important and vital object to the commerce of Central Asia, the opening of the river Indus to free trade, obtained by the advance of the British Army in 1838, will be duly appreciated, and recompense government for the outlay it caused. As soon therefore as this power is brought into play, we may expect to see the trade on this river rival that of its sister-river, the Ganges. But in opening up this river, another grand object has been obtained—a blow given to barbarism in Central Asia, and a way laid open to the advancement of European civilization.

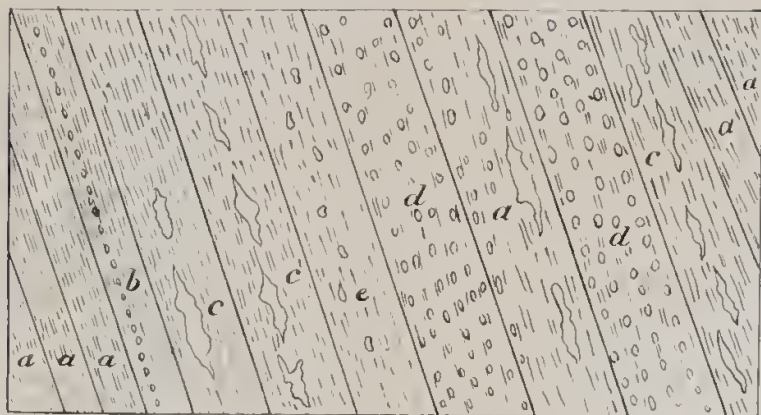
As we ascend the river from Maree, which must be done in a boat, as there is no road on either side, we meet with highly inclined strata of sandstone, with beds of boulders of quartz, granite, syenite, trap, &c. (Fig. I. *d*.) dipping under an angle of 30° to the N. by E; in

some places the boulders are six feet in diameter, and with their longest axis is always parallel to the dip of the strata. The same observation was made by Saussure in the Swiss Alps, where he observed conglomerates inclined, for the most part of an ovoidal-shape, and in the position mentioned. From this he inferred, and that too correctly, that such strata must have been formerly horizontal, each oval pebble having originally settled at the bottom of the water in this position. You sometimes meet the boulders, all of which are more or less smooth and rounded by attrition, lying in a different position from the one mentioned, which has been satisfactorily explained by supposing, that during their deposition they met with resistance, and the water therefore acting on them, gave them the position they now present; in other instances we meet with them arranged in single rows (Fig. 2. *b*,) or in beds alternating with the sandstone, or in only detached boulders (Fig. I. *e*,) yet having the above position. In fact, if a similar action as that which raised the sandstone strata forming the banks of the Indus, were now to be called into action upon the bed of that river, we would have a similar arrangement presented, and as the boulders generally lie in a N. E. or N. by W. direction, we are entitled to infer, that the current by which they were deposited flowed from these quarters, and that afterwards by plutonian action, the beds were raised to the position they now hold.

The sandstone which is generally of a white grey or greenish grey colour, more seldom red, (but in these beds alternating with the grey varieties,) in many places is so soft as to crumble under the finger. In it we also meet with contemporaneous beds of quartz rock (*c*) pointing out shifts that abound all along the cliffs, (See Fig. 2.) The cliffs in general have mural faces rising to a height of two and three hundred feet, presenting a very bold and rugged appearance; about a coss above Maree their height is greatest, and decreases as we ascend. Cutting through these, innumerable deep ravines are seen, exposing well the structure of the rocks. In all those places where the river is hemmed in by banks, it is very rapid and deep, as at Mukud and Sharkee, &c. This department has been ably investigated by Lieut. Wood,\* who devoted much time in surveying the river.

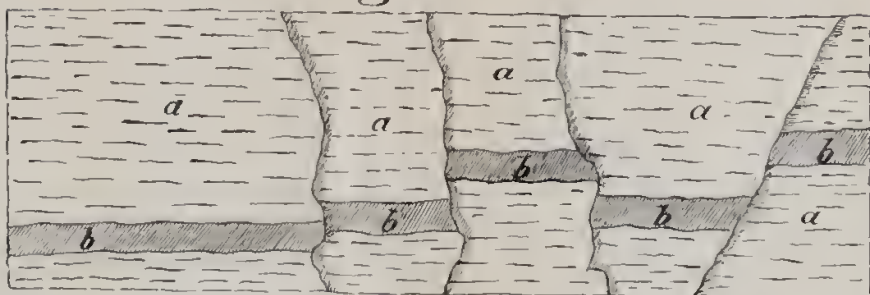
\* Survey of the River Indus, Journal of the Asiatic Society.

*Fig: 1.*



*a Sandstone b. Sandstone with single row of boulders  
c Imbedded quartz d. Bed of boulders e. Single boulders*

*Fig: 2*



*a.a. sandstone bb Quartz*

*Sandstone Clefs at Marce Dr. Jameson's report on  
the Geology of the Punjab*





*Quartz Rock.*—The quartz rock occurs in various modifications, either in beds, veins, or amorphous masses; in colour generally white or greyish white, and it being much harder than the sandstone, it stands out in bold relief.

*Scenery.*—The scenery on the banks of the river is uniform in the extreme, nothing being presented to the eye but bare, barren rocks, and white sandy beds, rendered more so by efflorescences of rock salt from springs, which issue from the banks in great numbers.

*Gold-washing.*—Between Attock and Kalabágh, about three hundred individuals are engaged in washing the sand for the gold it contains, which occurs in small flattened grains. They go in parties of seven and eight, and use eight different kind of implements; 1. *large wooden trough* for receiving sand; 2. *pick* for removing stones to get at the sand; 3. *shovel*; 4. *sieve*. On it the sand is thrown and washed through into the large trough with water raised by 5. a *wooden scoop*, which prevents any stones entering the trough with the sand—6, 7 and 8 are different kinds of wooden vessels for receiving the sand after being properly washed. It is then carried to their houses and mixed with a little mercury which attracts the gold, and by exposing it to heat, the mercury is driven off again and the gold left, which is sold at the rate of sixteen rupees per tola—four drams. A fourth of this, however, is exacted by the Mallicks. The washers seldom realize more than four annas per diem, generally about three annas, the gold extracted per day varying from one to two mashas, which is equal to the twelfth part of a tola. The sand which yields the gold, being that left after the washing, has in general a deep black colour, and is obtained in greatest abundance immediately after the river falls. The variety of gold is the purest gold—yellow gold.

Having examined the country beyond Sharkee, and meeting with nothing but the sandstone, we returned to Kalabágh, in order to proceed to Peshawur via Shuckardurrah, Elrichi, &c. As Wood and Burnes had mentioned the existence of coal in this direction, and as no person had made a geological examination of the country, we were desirous to ascertain whether the carboniferous series was to be met with in this direction.

On crossing the river at Maree, we ascended the Gossai nullah, which during the cold weather contains but little water, and proceeded in a

N. N. W. direction. The strata met with consists of sandstone and red marl, highly inclined, dipping to the S. S. W. under an angle of  $60^{\circ}$ ; succeeding to these, we find the boulder sandstone, also highly inclined, dipping S. E. by E. and presenting the same kind of structure as already noticed. In it thin seams of coal occur, similar to that met at Kalabágh. The road leading along the bed of the nullah becomes so very contracted, as to allow nothing more than a single laden camel to proceed at a time, the banks on either side rising to a height of several hundred feet, and nothing being seen but the blue vault of heaven. The first halting place is Cutchee, distant six coss. Here there is a small village and a spring of fresh water, which is rarely met with in this district. We encamped in a field, being one of the few seen, the country being bare and barren in the extreme. The rocks around are the red marl and sandstone, inclining S. S. W. under an angle of  $60^{\circ}$ . On leaving the bed of the nullah, we ascended a small sandstone hill, over which the road runs, and from whence begins the range that separates the Cohat from the Peshawur valley. Teera or Khybur range is seen, bearing N. N. W. And we have also a fine view of the snow-clad mountains beyond Caubul. From it we descended into the Chuppi nullah, which is the boundary mark between the Kalabágh and Shuckardurrah estates. A short distance onwards is Chushmah, so named from a spring of fresh water occurring.

*Chushmah.*—Here we halted, owing to the rugged nature of the country over which we had come; though the distance was only seven coss, we did not reach the encamping ground till the afternoon, having started at ten A. M. From Chushmah, the country gradually becomes more cultivated; at first we only see here and there a cultivated field on the side of the mountain, and all around a barren waste, these by degree increased in number, till we meet with open and extensively cultivated valleys; and so with the road, it at first being through small and contracted nullahs, these opening and leading through plains, separating which, there are several rugged passes, difficult for camels. Close to Shuckardurrah, there is a high hill named Oukini,\* in the country of Russool Khan, from whence salt is obtained, and yields to him a considerable revenue. On the banks of a

\* Oukini Salt Mine.

small stream near to it, sandstone occurs jointed, the joints being at right angles to the seams of stratification. On leaving Shuckardurrah, the route lies along the bed of the Turali river, in which we have the following interesting section. (Fig. III.) The rocks dip almost due south under an angle of  $80^{\circ}$ , and as we proceed, we meet with red, green, and grey sandstones, with the same dip and angle of inclination; and resting upon them in an unconformable position there is an immense bed of clay, about seventy feet thick, filled with boulders of trap, quartz rock, granite, &c. These strata continued onwards till a little beyond Shebicki, where we meet with fossiliferous limestone, which forms all the strata in the neighbourhood of Cohat. In the centre of the valley, a diluvial conglomerate is here and there seen cropping out.

Separating the Cohat from the Peshawur valley we have the Teera or Khyber range, as already mentioned. It rises a little below the fort of Attock, from the right bank of the river Indus, and runs in a Westerly direction till it meets the Solimaun ridge, south of Suffeid Koh, increasing in height as it proceeds onwards.\* The Pass is about 1500 feet in height, very rocky, rugged, and steep, and about two coss in length. The rock consists of the same fossiliferous limestone as that met with in the valley of Cohat, and dips under an angle of  $55^{\circ}$  to S. W. Whether this rock occurs at the Northern side of the Pass we were not able to ascertain, as, on reaching the summit, we were driven back by the Afreedees, with the loss of several of our followers.

*Springs.*—At Cohat, the springs supply so much water, as to irrigate the whole of Sultan Mohamad Khan's country, which is about seven coss in length; their temperature was  $84^{\circ}$  Fah.; early in the morning, that of the air being  $34^{\circ}$  Fah. We returned from Cohat via Toghan, Gummut and Pehar; the country in many places being very wild and mountainous, the rocks met with similar to those already noticed, and recrossed the Indus at Honshialghur, where the sandstone with boulders is still found forming the banks of the river. The sandstone is continued on to Futeh Jung, and is superceded half way between this place and Hussun Abdal, by a nummulitic limestone. At Hussun Abdal, the whole district is composed of compact limestone. There is

\* Elphinstone's *Caubul*, Vol. II. page 401.

a lake on the summit of a mountain 12,00 feet in height, to the N. of the town, and is visited both by Hindoo and Mussulman pilgrims, each assigning his own reason for the appearance of the water.\* As to Cohat and other places already mentioned, we have large springs issuing from the limestone rock. In proceeding towards Peshawur, we again meet with alternations of sandstone and limestone till we arrive at Attock, when we find a dark bluish-black or reddish-brown clay slate, and cutting through it on the W. side of the river there are beds of trap (greenstone,) which lead to the supposition, that the slate, which has many of the characters of a transition slate, is nothing but a metamorphic slate clay of the saliferous series, altered by the action of heat. This supposition is strengthened by finding it associated with rocks belonging to this series. It dips to the S. under an angle of  $35^{\circ}$  to  $55^{\circ}$ .

Proceeding in a South-easterly direction from Hussun Abdal via Rawal Pindee, Manukeealla, Buckralla, and Rotus to Jehlum, we pass over strata first composed of limestone (magnesian,) succeeded by sandstone and red marl, which is well seen in the wild mountainous and rugged country extending from Buckralla to Kora, a distance of three coss, the route winding through a deep ravine, the mountains rising to a height of several hundred feet above it. The descent into this ravine is by a Pass, also several hundred feet in height, but which has been so levelled and formed by salient and re-entrant angles, as to allow a loaded camel either to proceed up or down. The rocks are red, green and white marls and sandstone, all highly inclined. On crossing the Jehlum, we pass over a few small hills, and composed of sandstone, probably of an age similar to that which contains the fossil organic remains found so well developed in the Sevalic range, between the Jumna and Sutledge, and from thence got into the open plain, the structure of which we have already noticed. With these remarks, we conclude our account of the Neptunian rocks, which form the strata of the salt range.

\* By the Hindoos it is said that Baba Nanuck struck the rock, and made the water come forth. By the Mussulman it is said that on Mullah Allee Moortuzza, the brother of the prophet visiting this place, the mountain advanced to meet him; on coming near to it, he ordered it to remain, and water issued forth from the place on which his hand rested, and several others. This happened about twelve hundred years ago !



*Plutonian Rocks.*—It is a remarkable fact, regarding the geological structure of this country, that though we meet every where, with the evidence of plutonian action in the disturbed, upraised, and altered state of the neptunian strata, there is only one locality where a plutonian rock is exposed; viz. at Attock. But probably the elevation of this range of mountains is connected with the great chain of the Hindoo Koosh. If so, it shews, that that system of mountains is as new as the saliferous series, and this is supported by the observations of Dr. Lord, who in company with Lieutenant Wood, ascended one of the highest Passes of that range.\* That, however, plutonian action existed prior to the deposition of these strata, we are entitled to infer from the number and size of boulders, which are found imbedded in the sandstone strata, forming the banks of the river Indus, so that though the Hindoo Koosh, (which is a mere extension of the Himalayas, seeing that according to Humboldt they can be traced onwards to the volcanic Island of Formosa,) existed in the form of mountains; the position which it now presents was not attained till after the deposition of the saliferous series, and probably not till a later geological period, as we shall no doubt find many of the strata, which occur at the foot of the Himalayas, or among them, belonging to a much newer system; but to speak definitely, requires much further investigation, and at present we only can assert, that that range of mountains is newer than the saliferous series. Having now brought the first part of our report to a conclusion, it only remains for us to notice those individuals who assisted us in carrying on our investigation, to whom we are under great obligations. To Mr. G. Clerk, Governor General's Agent, we beg to return our best thanks. To him we are indebted for every thing. Through his interest and representation we received a most welcome reception at the court of Lahore, and means were put at our command of traversing the whole of his Highness Maharaja Shere Singh's dominions without molestation; and we cannot here pass unnoticed, the friendly reception that we every where met with in the Punjaub. When thrown into difficulties at Cohat, where I was obliged for sometime to take refuge in the fort of Sirdar Kadir Khan, Mr. Clerk again came forward with his assistance, and procured for me an escort of horse from his Highness the Maharaja.

\* McClelland's Calcutta Journal of Natural History, No. 4, in which a notice of Lord's Geological Observations has been given.

To Captain Mackeson, Political Agent at Peshawur, we beg also to return our best thanks, for procuring for us, through General Avitabile, protection from the Cohat chiefs, and for his hospitable reception on our arrival at Peshawur.

(Signed,) W. JAMESON,

AMBALA, 28th June, 1842.

On Deputation on the Indus.

*Barometrical Observations taken to ascertain the Altitude of the Station of Purulia, in the Ramghur District. By Capt. HANNYNGTON, 24th N. I. 1st Assistant to the Governor General's Agent, Maunbhoom.*

In collecting the various documents relative to the Storm of 2nd and 3rd June 1842, which form the subject of my Seventh Memoir, I had occasion to solicit from Captain Hannyngton, to render his valuable report fully available for my purpose, the Barometrical correction for the difference of altitudes, and to obtain this more correctly, he requested me to obtain for him from Major Bedford, of the Surveyor General's Office, synchronous observations.

As every point of which the altitude can be thus determined, forms a valuable addition to our knowledge of the physical geography of India, I have requested Capt. H. to allow me to publish his results, which he modestly wished me to do in a foot note; but as it would much resemble putting a thing in the place least likely for it to be found when wanted, I have taken the liberty of making a separate, though brief, article of the observations, with his remarks.—H. PIDDINGTON.

The observations duly corrected were as follows:—

*On 13th July, 1842.*

	8 A. M.		10 A. M.			4 P. M.		
	Bar.	Ther.	Bar.	Ther.		Bar.	Ther.	
Calcutta, ....	29.493*	Alt. 81° Det. 79.6	29.526	Alt. 82° Det. 81.5		29.450	Alt. 83° Det. 82.7	
Purulia, ....	28.830	82° 80.0	28.835	83.5 81		28.795	84 82	

NOTE—The observations at Purulia at 2 P. M. could not be depended upon.



By Mr. F. Baily's formula, each pair of the observations separately calculated give

8 A. M.	Deduced altitude of Purulia,	...	...	663.62	feet
10 A. M.	... Do.	...	..	694.23	„
4. P. M.	... Do.	...	..	659.59	„
				Mean	672.48 „
The Mean of the Observations gives				..	.. 676.10 „
And the same by Hutton's method, ...				..	.. 674.77 „
				Final Mean	674.45 „

Hence we may suppose that Purulia is about 670 feet above Calcutta.

By reducing the Mean of the Barometers to the Mean Temperature at Calcutta, we have

Calcutta,	.....	29.496
Purulia,	.....	28.820
Diff.		0.676

I suppose this may be taken for the Barometrical equivalent. Indeed, it appears that within moderate limits, and under similar temperature, the Barometrical difference  $\times 1000 =$  the difference of altitude between any two places in feet. It agrees very closely in this instance. I have not seen the rule so simply stated, but it is nearly true, and for the plains of India perhaps sufficiently so. The logarithmic rule is, however, easy enough.

*Brigadier TWEMLOW, on Artificial Fuel. Received from the Agricultural Society.*

*To the Secretary to the Agricultural and Horticultural Society of Calcutta.*

Ellichpoor, 30th August, 1841.

SIR,—With reference to the notice contained in my letter of the 2nd instant, regarding clearing forest lands for cultivation, whilst making a substitute for coal, I have the honor to state, that this is a subject which I endeavoured to bring into notice so far back as the month of August of the year 1833, (copy of letter annexed.)

The following are some of the ingredients which might, I conceive, be mixed with charcoal, or inferior coals:—

1st. Bitumen, Pitch, and Tar, (obtained when burning the charcoal in inclined cylinders or furnaces.)

2nd. Oils, a small quantity of lime added to give packing consistency.

3rd. Gum Resins, extracts from Cactus and other Milky Plants and Trees, and Unctuous Clay.

4th. Seeds of Cotton; Oil Plants; refuse of Mills; of Distilleries; Fecula of Flax, Hemp, Indigo, &c.

5th. If the properties or smell of the above are objectionable, the mode adopted with success by the natives of India generally, for making charcoal fire balls for hookahs, by using the starch of rice or other grains might perhaps be the best, as most universally practicable.

Once made an article of commerce, the pressed charcoal, whether in bricks, balls, or blocks, would be brought to the coast by Binjarrah Tandahs\* going down to the coast for salt and other articles; the turbulent hill tribes,† would without being aware of it, cut down their at present almost inaccessible forest dens of refuge; and lands once covered with rich cultivation, such as those near the Taptee and other rivers, would again put on the garb of civilization, instead of being, as at present, the resort of the bison, the wild dog, sheep, and goat.

\* Tandah, a community of Binjarrah; some having a thousand head of cattle.

† If the Bheel corps had each a company of Miners and Pioneers attached, discoveries, mineral and geological, would follow. The cave-making Ancients found their advantage in such excavations.

If it should be objected, that by exhausting the forests, the want of fuel would cause inconvenience, the reply would be, the more this is felt, the more search will be made, (and there can be no doubt with success,) for *coal*, of which nature in all probability has provided in India an ample supply.\*

Search is making in Berar for coal. The sandstone,† indurated clay with fossils,‡ limestone, salt beds,§ give hope. The hills near Guwilghur, after rain, have the shining black sand (found wherever gold exists,)|| in all the courses for water on the laterite plateaus overlying the trap and basalt. The limestone is in ridges at the base of the hills to the south, and generally outside (though much intermixed with) the sandstone. The space between the outer ridge of limestone, and the inner of sandstone, would appear, with reference to its height above the valley of Berar, admirably adapted for lakes of irrigation or reservoirs to feed canals; but this is looking perhaps, too far forward.

I have the honor to be, Sir,

Your obedient humble servant,

GEORGE TWEMLOW, *Captain*,

*Bengal Artillery.*

#### COPY FORM LETTER BOOK.

*To the Secretary to the Steam Committee, Bombay.*

Aurangabad, 9th August, 1833.

SIR,—Permit me to suggest to the Committee, that in the event of “coal” not being procurable in sufficient abundance in India, an arti-

\* When renewing the bund of the lake below the caves of Ellora, I had to dig very deep for foundation; an unctuous black mud deposit prevailed deep down, which would I conceive in course of ages, have assumed the consistency of coal. All the charcoal dust from the periodical burning of the hills had washed towards the bund, in all probability, and this mixed with fecula of fish, vegetables, &c. may have caused the appearance of the mud alluded to.

† The sandstone in all degrees of induration and cementation may be seen five miles North of the cantonment of Ellichpoor in contiguity with limestone and indurated clay; the sandstone distinctly stratified, but subverted as if heaved up.

‡ To be seen at Mokhtagherry, six miles North East of the cantonment of Ellichpoor.

§ Salt beds. Cattle thrive in Berar from the *salt* leeks. Salt is made rudely, by evaporation, at a village between Omrouttee and Ellichpoor.

|| Shining black ore, perhaps sulphuret of iron? Some of this has been sent in a letter to the Curator of the Museum of Economic Geology, to be tested. It was the common titaniferous Iron sand of India.—H. P.

ficial substitute for it might be made, where forests exist near the Coast, by mixing bitumen and pounded charcoal, (or in the interior of India cow-dung, clay and charcoal,) with a proportion of the unctuous mud used by the natives in making their "Ooplees."

The mixture to be moulded into the shape of *bricks*, and pressed by a powerful screw and lever, of a simple construction, into the smallest possible space, consistent with suitable ignition.

Refuse oil cakes might be a cheap substitute for bitumen. If this sort of brick should be found to answer, it might soon be made an article of commerce, and be prepared in every village, and in every Bin-jurrah camp within reach of the Coast; and the sooner to bring it about, natives might be deputed to make small advances, and to teach the mode of making the compound.

I have, &c.

(Signed)      GEORGE TWEMLOW.

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*The same sent to Calcutta.*

Refuse oil cakes called kullee, sell at Aurungabad at half rupee for 240 lb.—Charcoal 9 Rs. for 1600 lb.

The above is copied from Captain Twemlow's letter book; but the originals may somewhat differ, and the former materials possibly may not have been given in the letters.

The only object in sending this copy, of an old letter, is to remove any objection to interference with patents subsequently obtained for exclusive manufacture of artificial coal, whether in England or elsewhere. The "gool" makers of India have for ages made carboleine for hookas.

GEORGE TWEMLOW.

*Ellichpoor, August 30, 1841.*

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*Memorandum of 1841.*

If the upper seams of coal of the present mines can be improved by admixture, this might lead to working to better coal. The water thrown up by Steam engines at the pits should be carried by channels of irrigation over land *owned by the Company working the mines*. A

terraced road to the nearest navigable river might be so constructed, as to answer in the *centre* for locomotive carriages, the *sides* for channels of irrigation. Steam engines at the heads of successive levels throw up water; the terrace in this way if occasionally submerged, would attain great hardness, in fact be silicified in course of time in all probability. All road-making should be done conjointly with facilities for water; the supply of the four months is ample for the twelve if retained, instead of being permitted to run waste, and carry off soil, filling up rivers.

*A Companion to the Moon Table, by CAPT. SHORTREDE, 1st Assistant G. T. Survey.*

In order to have the times of true as well as of mean, new and full moon, I have constructed the present as a companion to the moon table, by means of which the corrections to be applied may be found to be less than half an hour of the truth.

The term syzygy (the same radically as संयुग conjunction) being used to denote indifferently the conjunction of new or full moon, it is obvious, that as at a syzygy the moon must be in line with the earth and sun, the first correction of the mean to the true time will be that arising from the unequal apparent motion of the sun in its orbit depending on the sun's anomaly. This correction which at its maximum is about 10 minutes more than 4 hours, may be taken at once from the back of the card to within a few minutes of its true amount. As the anomalistic year exceeds the tropical by 25m. 07.2s. and the Julian by 13m. 58.8s., the relative position of the two circles on this card ought properly to be shifted by corresponding quantities, amounting to about 1 day in 57.3 years in N. S., or 103 years in O. S.; but as this can very easily be taken account of, I have thought it unnecessary to provide for it by a moveable card. If the moon table were provided with a vernier, or other means to admit of being read with certainty and ease to within an hour, it might be worth while to add here a moveable card; but for the present these considerations give way to convenience.



The following tables shew the position of the marks on the outer and inner circles (in half days,) for the Epoch, 1st January, 1800.

h. m.		+		---				1	6	11	16	21	26
0.00	00.00	27.50	27.50	55.00		January,	0.10	0.85	1.61	2.36	3.11	3.87	
10	0.34	27.14	27.86	54.66		February,	4.77	5.52	6.27	7.03	7.78	8.54	
20	0.69	26.78	28.22	54.31		March, ...	8.99	9.84	10.50	11.25	12.00	12.75	
30	1.03	26.42	28.58	53.97		April, .....	13.66	14.41	15.17	15.92	16.67	17.43	
40	1.38	26.06	28.94	53.62		May, .....	18.18	18.93	19.69	20.44	21.20	21.95	
50	1.73	25.70	29.30	53.27		June, .....	22.85	25.61	24.36	25.11	25.87	26.62	
1.00	2.08	25.33	29.67	52.92		July, .....	27.37	28.13	28.88	29.63	30.39	31.14	
10	2.43	24.96	30.04	52.57		August, ...	32.05	32.80	33.55	34.30	35.06	35.81	
20	2.79	24.59	30.41	52.22		September	36.72	37.47	38.22	38.98	39.73	40.48	
30	3.16	24.21	30.79	51.84		October, ...	41.24	41.99	42.74	43.50	44.25	45.00	
40	3.53	23.82	31.18	51.47		November	45.91	46.66	47.41	48.17	48.92	49.67	
50	3.91	23.43	31.57	51.09		December	50.43	51.18	51.93	52.68	53.44	54.19	
2.00	4.29	23.03	31.97	50.71									
10	4.69	22.62	32.38	50.31									
20	5.10	22.19	32.81	49.90									
30	5.52	21.76	33.24	49.48									
40	5.96	21.30	33.70	49.04									
50	6.42	20.83	34.17	48.58									
3.00	6.90	20.33	34.67	48.10									
10	7.42	19.80	35.20	47.58									
20	7.98	19.23	35.77	47.02									
30	8.51	18.61	36.39	46.49									
40	9.26	17.92	37.08	45.74									
50	10.00	17.11	37.89	45.00									
4.00	11.05	15.07	38.93	43.95									
10	13.56	13.56	41.44	41.44									

Year.	Place on the card.	Year.	Place on the card.	Year.	Place on the card.	Year.	Place on the card.
00	00.00	01	13.55	02	27.11	03	40.66
04	1.21	05	14.77	06	28.32	07	41.87
08	2.43	09	15.98	10	29.53	11	43.09
12	3.64	13	17.19	14	30.75	15	44.30
16	4.85	17	18.41	18	31.96	19	45.51
20	6.07	21	19.62	22	33.17	23	46.73
24	7.28	25	20.83	26	34.39	27	47.94
28	8.49	29	22.05	30	35.60	31	49.15
32	9.71	33	23.26	34	36.81	35	50.37
36	10.92	37	24.47	38	38.03	39	51.58
40	12.13	41	25.69	42	39.24	43	52.79
44	13.35	45	26.90	46	40.45	47	54.01
48	14.56	49	28.11	50	41.67	51	0.22
52	15.77	53	29.33	54	42.88	55	1.43
56	16.99	57	30.54	58	44.09	59	2.65
60	18.20	61	31.75	62	45.31	63	3.86
64	19.41	65	32.97	66	46.52	67	5.07
68	20.63	69	34.18	70	47.73	71	6.29
72	21.84	73	35.39	74	48.95	75	7.50
76	23.05	77	36.61	78	50.16	79	8.71
80	24.27	81	37.82	82	51.37	83	9.93
84	25.48	85	39.03	86	52.59	87	11.14
88	26.69	89	40.25	90	53.80	91	12.35
92	27.91	93	41.46	94	0.01	95	13.57
96	29.12	97	42.67	98	1.23	99	14.78
1.00	{ 28.33 30.33						14.78

double mark for leap year being inconvenient to put upon this card, is omitted ; its place is supplied by a double mark for January and February on the month card.

In 1325 anomalistic revolutions, there are 36509d. 19h. 22m. 55s., being less than a Gregorian century by 14d. 4h. 37m. 05s., and than a Julian by 15d. 4h. 37m. 05s. These centurial Epacts reduced as above, became in half days 28.329 and 30.325 respectively, or 28.33 and 30.33 nearly enough.

With regard to the position of the full century marks on the middle cards, we have

o ' "

Moon's mean longitude on 1st January 1801, 111.36.42.1  
Mean longitude of moon's perigee do. 246.06.05.1  
∴ Moon's mean anomaly on 1st January 1801, is 205.30.37

This corresponds to 15.7404 anomaly days past the perigee, which adding .0065 for the difference between Paris and Greenwich, gives 15.7469d.; and subtracting a common year Epact=6.777, we have 8.97d. for 1st January 1801, in civil time at Greenwich, or 17.94 half days as in the following table.

Cent.	N. S.	O. S.	B. C. or —	Cent.	N. S.	O. S.	B. C. or —	The hour marks on the inner circle of the middle Card stand thus—				
								H. M.	Place of mark on Card.			
									—	—	+	+
0	50.00	46.00	46.00	20	21.60	47.60	44.40	0.00	0.00	27.50	27.50	55.00
1	23.33	21.33	15.67	21	49.93	22.93	14.07	1.	0.96	26.66	28.34	54.04
2	51.66	51.66	40.34	22	23.26	53.26	38.74	2.	1.94	25.83	29.17	53.06
3	24.99	26.99	10.01	23	51.59	28.59	8.41	3.	2.94	24.96	30.04	52.06
4	0.33	2.32	34.68	24	26.92	3.92	33.08	4.	3.98	24.07	30.93	51.02
5	28.65	32.65	4.35	25	0.25	34.25	2.75	5.	5.05	23.12	31.88	49.95
6	1.98	7.98	29.02	26	28.58	9.58	27.42	6.	6.20	22.10	32.90	48.80
7	30.31	38.31	53.69	27	1.91	39.91	52.09	7.	7.46	21.01	33.99	47.54
8	5.64	13.64	23.36	28	32.24	15.24	21.76	8.	8.93	19.66	35.34	46.07
9	33.97	43.97	48.03	29	5.57	45.57	46.43	9.	10.73	17.89	37.11	44.27
10	7.30	19.30	17.70	30	33.90	20.90	16.10	9.48	14.33	14.33	40.67	40.67
11	35.63	49.63	42.37	31	7.23	51.23	40.77					
12	10.96	24.96	12.04	32	37.56	26.56	10.44					
13	39.29	0.29	36.71	33	10.89	1.89	35.11					
14	12.62	30.62	6.38	34	39.22	32.22	4.78					
15	40.95	5.95	31.05	35	12.55	7.55	29.45					
16	16.28	36.28	0.72	36	42.88	37.88	54.12					
17	44.61	11.61	25.39	37	16.21	13.21	23.79					
18	17.94	41.94	50.06	38	44.54	43.54	48.46					
19	46.27	17.27	19.73	39	17.87	18.87	18.13					
20	21.60	47.60	44.40	40	46.20	49.20	42.80					

The division lines and marks on the three cards being not continuous in these as in the week-day table, a silk thread is attached to them, in order to facilitate the bringing of the proper marks on the cards correctly into line. With the same view, the month marks have been projected on the circle separating the months and days. These marks are so small, as not to attract attention unless particularly looked for.

The method of using and manipulating these moon tables is so perfectly analogous to that formerly detailed for the week-day table, that beyond the directions on the face of the cards, nothing more seems necessary. An example or two may suffice. Required true time of full moon in October 1841, the 18 on the outer circle of the middle card being set to ●● on the outer, and the mark for October brought in line with that for the current year 41;

The month marks on the inner Card stand thus—

	Common.	Leap.
January,.....	0°00	2°00
February,.....	48°12	50°12
March,.....	47°24	
April,.....	40°36	
May,.....	45°48	
June,.....	28°60	
July,.....	23°72	
August,.....	16°84	
September, ..	9°96	
October,.....	5°08	
November, ..	53°20	
December, ..	48°32	

the full moon mark ○ falls almost exactly on the line between 29 and 30, hence the time of mean full moon is on the 30th at 0h. A. M. For this date, the back of the *Companion* gives 4.18h. to be *subtracted*: then for 1841 October, 29d. 8h. P. M. the face of the *Companion* gives 9.47h. to be *added*: the time of *true* full moon is thus the 30th at 5h. 29m. A. M. To which adding 5h. 54m. as the diff. of longitude between Greenwich and Calcutta, we get 30d. 11h. 23m. A. M. as the time at Calcutta. I have not at present the means of comparing with the Nautical Almanac, but the old tables, supposed to be Ferguson's, give 30d. 0h. 03m. 31s.\* the difference being about 40 minutes.

An Eclipse of the sun is said to have been seen at Babylon in March 721, B. C. = 8.80 O.S. Now 8, being set to ●●, and March in line to 80, mean new moon was about 20d. 2h. A. M.  $\frac{721+1800}{103} = 24.5$ , to which add 12 days for diff. of styles and 20th March + 36 is 5th April, for which date the first Equation is +4.08m. and this applied to 20d. 6h. gives 20d. 6h. 08m. A. M. and for this date year 8.80, the *Companion* gives the 2d Equation +9h. 30m., and this gives the true time 20d. 3h., 38m. P. M., and adding 3h. for diff. of longitude, the time of new moon

\* The Almanac in Rushton's work gives a day earlier by some mistake, which (or 12 hours) appears to run through every month of the year.







at Babylon in March 701, B. C. becomes 20d. 6h. 38m.; hence, to have been visible, the Eclipse must have happened at sun-set.

Required the day of full moon in March 1720, B. C.? The moon table gives at once 24d. 10h. A. M., and applying the Equations from the Companion, we find 24d. 7h. P. M. and 3h. for diff. of long. gives at Babylon 24d. 10h. P. M. It is therefore altogether a mistake to say, as is said in Rushton's work, that an Eclipse of the moon could have occurred on the 19th of March, 1720 B. C. Even had the date been correct, the moon was upwards of  $65^\circ$  from the node when full in March 1720 B. C., when of course an Eclipse was out of all possibility.

It is obvious that these tables may be useful in many cases to nautical men, who have occasion to know the time of high water at a port. They may be useful also to the traveller, who wishes to know when he will have moonlight. Europeans, who have occasion to know the common native date may find them of good use. Perhaps also the Joshis may find them useful in making their Almanacs, as the *Companion* with its principal will shew what **तोथि** are **चय** and what are **आधिक** more correctly, and with vastly less trouble than the methods now in use.

*November, 1841.*

*Account of a luminous Meteor seen at Charka, lat.  $24^\circ 06'$ , long.  $81^\circ 02'$ . on the morning of the 11th April 1842, By CAPT. SHORTEDE, 1st Assistant G. T. Survey.*

A little before 4 o'clock this morning, I saw a meteor of a singular appearance, of which the following is an account :—

I was lying awake outside my tent, and about a minute or two before had closed my eyes, intending to have a short sleep before marching, when my attention was roused by some brilliant light before me. On opening my eyes, I saw a meteor having very much the appearance of a rocket: it was situated in the constellation Scorpio, having its middle about  $10^\circ$  to the westward of Antares, and pointing towards the constellation Corvus, the lower star of which was about  $4^\circ$  above the horizon. The meteor was about  $10^\circ$  or  $20^\circ$  long, and equally bright

throughout, except at the upper end, where it was rather faint. It continued in the same position, and of the same brightness for between 2 and 3 minutes as well as I could judge, and then gradually became fainter and fainter, till it lost its brilliancy altogether: and as it began to fade, it began also to become crooked, and to move towards the west. It became gradually more crooked, and continued to fade till it became like a thin smoke, and at last vanished away at about  $3^{\circ}$  or  $4^{\circ}$  from the place where I first saw it. I listened attentively, but heard no noise. From the time I first saw it till its brilliancy ceased, was probably about 5 minutes, and in about 3 minutes more it ceased to be any longer remarkable.

I was then at Charka, in lat.  $24^{\circ} 06'$  and long.  $81^{\circ} 20'$ .

*Dewra, 11th April, 1842.*

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*Analysis of Iron Ores from Tavoy and Mergui, and of Limestone from Mergui. By Dr. A. URE, London. Communicated for the Museum Economic Geology of India, by E. A. BLUNDELL, Esq. Commissioner, Tenasserim Provinces.*

On the right bank of the Tavoy river, opposite the town of Tavoy, runs a range of low hills at a distance from the river varying from one and a half to three miles, formed apparently of magnetic iron ore. The range extends a distance of five or six miles. At about its Northern extremity, on the summit of a hill about 150 feet in height, is found the large projecting rock mentioned in page 28 of Dr. Helfer's Second Report. This rock is about one and a half mile distant in a direct line to the bank of the river, to a spot itself distant about three miles North of the town of Tavoy. This large rock is highly magnetic on its Northern side. (According to the expression of the natives, it is alive on its Northern and dead on its Southern side). The hill appears entirely formed of this ore, and at the bottom of it are to be found the rolled masses of from two to twenty lbs mentioned by Dr. Helfer. Between the hill and the river are rice fields, through which runs a small nullah, and having between the hill and the fields about quarter of a mile of high ground well adapted for buildings, and on which high ground are found the rolled masses or boulders above alluded to.

The nullah can convey boats of three to four tons, half way through the rice fields. The same description answers for the whole extent of the range of low iron hills, having here and there small nullahs, communicating with the river. This ore was once worked by the Burmese during the time of an expedition against Siam, for iron to make swords, knives, spears, and other weapons. People were sent from Ava to smelt it, but the process appears unknown to the Tavoyers. There are still to be seen the pits in which it was smelted, with the scorix around the edges. The quantity of the ore appears inexhaustible.

Limestone is procurable in the province, and no doubt many localities of it will be discovered. The only one yet properly ascertained exists about fifteen miles to the Eastward of Tavoy, accessible by water to within a distance of two miles by small boats of half ton burthen. Between the locality and the stream, the land is level and high, affording facility for a road. The quantity is abundant.

Charcoal may be made with ease, owing to the abundance of excellent wood in the country adapted to it.

No. 1.—Pieces of ore knocked off the large rock mentioned by Dr. Helfer, in page 28 of his Report.

No. 2.—Pieces of ore dug up in the neighbourhood of the above large rock.

No. 3.—Rolled masses of iron ore picked up on the high ground, between the hill and the rice field.

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*Mergui.*—About 10 miles S. W. of the town of Mergui, is an island, comprising a hill about 200 feet in height, formed apparently of iron ore. The island is perfectly accessible to boats of every description, and you land on large masses of rock, which prove to be the iron ore from which the soil has been washed away. The hill rising abruptly from the water, may be about a mile in circumference, and is wholly formed of the ore, having a rich bed of soil. A similar island, equally accessible, is formed about four miles to the Southward of the one above mentioned. It is not known that this ore has ever been worked, and the process seems unknown to the people of Mergui.

Limestone is found in several accessible localities on the main branch of the Tenasserim river, not far above the old town of that name. Specimens accompany the iron ore.

No. 1.—Boulders of iron ore picked up at the landing place of the island above mentioned.

No. 2.—Pieces knocked off large masses at landing place.

No. 3.—Pieces dug up on the hill.

No. 4.—Specimens of limestone.

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*London, 13, Charlotte Street, Bedford, Square, 26th Nov. 1842.*

I have now the pleasure of handing you the details of my examination and analysis of the several ores of iron and the limestones from Tavoy and Mergui, with which I have been almost constantly occupied during the last fortnight.

1st. Compact magnetic iron ore.—Tavoy, No. 1.

Colour iron black with a metallic glimmer, fracture fine grained, possesses magnetic polarity, specific gravity 3.511, compared to water = 1,000.

It yields in analysis the following constituents:

Peroxide of iron	...	...	...	86.5	equivalent to 60.55 metal.
Silica with a trace of phosphate	}	3.5			
of lime, ... ..					
Water, ... ..	—	...	10.0		
				100.0	

It contains no manganese or titanium.

2d. Compact magnetic iron ore.—Tavoy, No. 4.

External and Magnetic characters as above.

Specific gravity, 3.462.

It yields in analysis:

Peroxide of iron	...	...	...	86.0	equal to 60.2 metal.
Silica with a trace of phosphate	}	0.9			
of lime, ... ..					
Water, ... ..	...	...	13.1		
				100.0	

It contains neither manganese nor titanium.

3d. Tavoy ore, No. 2.—External characters as above.

Specific gravity, ... .. 4.369.

4th. Tavoy ore, No. 3.—Characters as above, as to aspect and magnetism.

Specific gravity, 4.100.

The two latter samples are even richer than the former, as is evinced by the specific gravity, but they are all quite rich enough and pure enough for making the best quality of bar-iron and steel.

I instituted two elaborate sets of experiments in search of titanium, which when present in any notable quantity in iron ores, renders the iron made from them red-short, but I found none in the above ores. In the first set of experiments I treated the ore as follows: I added to its solution in nitro-muriatic acid, so much tartaric acid as to render all the oxides unprecipitable by ammonia. I next added ammonia in excess, and afterwards hydro-sulphuret of ammonia, which throws down all the metals except titanium. The whole being thrown upon a filter, afforded a colourless liquid which evaporated to dryness, and carefully ignited in a platinum cup, left no trace of titanic acid, which it would have done, had any of that metal existed in the ore.

The second set of experiments for titanium consisted in transmitting sulphuretted hydrogen in excess through the nitro-muriatic solution of the ore, in then adding ammonia in excess, the effect of which is to precipitate both the iron and titanium. But the precipitate when digested with sulphurous acid, has its iron dissolved, while the titanic acid will remain undissolved as a white powder. By this means also no distinct evidence of titanium could be obtained.

5th.—The limestone from Tavoy has a specific gravity of 2.7, and is a perfectly pure, semi-crystalline carbonate of lime, akin to statuary marble. It is well adapted to act as a flux in the smelting of iron.

The three samples of iron ores from Mergui, are brown hematites, and from their density, will afford good iron in the smelting furnace.

6—Mergui iron stone No. 1 specific gravity 3.37.

7	Ditto.	Ditto.	2	Ditto.	3.18.
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8	Ditto.	Ditto.	3	Ditto.	3.32.
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The limestone of Mergui has a specific gravity of 2.7; it is a pure calcareous carbonate. I analyzed both the limestones.

I am, dear Sir,

Yours truly,

(Signed)

ANDREW URE.



*Supplement to the Monograph of the Indian and Malayan species of Cuculidæ, or Birds of the Cuckoo family, published in Vol. XI, pp. 898, 1095, et seq. By EDWARD BLYTH, Curator of the Asiatic Society.*

Having received some annotations on my paper on *Cuculidæ* from Mr. Jerdon, and been favoured by Dr. McClelland with the loan of the *Zoologie du Voyage de M. Bélanger*, which has set me right with regard to the names of certain species, besides furnishing some other information concerning them, and having likewise learned one or two other facts worthy of publication, I shall not longer postpone the preparation of an Appendix to that paper, but proceed at once to its revision.

ACCIPITRINE CUCKOO; *Cuculus sparverioides*, Vigors and Gould. In Southern India, writes Mr. Jerdon, this species is "only found in the dense woods of the summit of the Neilgherries. It is seldom seen except when the woods are beaten for Woodcocks, and quits the shelter of the wood with reluctance. I never heard its note. Flight rapid. Stomach filled with caterpillars."

WHISTLING CUCKOO; *C. fugax*, Horsfield. The same observer continues — "Besides the Hindustani name given in my catalogue, its name in Telooḡoo is *Kuttee pitta*, i. e. 'Sword-bird,' given, it is said, from its peculiar and rapid flight. It is stated by the Shikarees to deposit its eggs in the nest of the Shikra! (*Astur Dussumieri*), which it so much resembles in colour. In the Deccan it is sometimes named *Zuk-kat* or 'Custom-house bird'." In Bengal, the young of this bird are far more numerous in open jungles than the Hawk mentioned, but I have not yet observed any particular species feeding them.\*

*C. Sonneratii*. "Only found in dense forest-jungle." Jerdon.

*C. niger*. "Dispersed over all the peninsula wherever there is much shelter. At Hydrabad I saw one of this kind in the grey plumage sitting on a trellis work in a garden expanding its wings continually, and close to the spot where it sat and within view was a nest of *Prinia socialis* containing two eggs, which I recognised to be those of that bird. It struck me at the time that the little Cuckoo had made the discovery of the nest, and was meditating the substitution of her own

\* A young specimen of apparently this bird from Macao is very much deeper-coloured than usual, and may possibly be of a different species.

egg. I suspect, therefore, that the rufous specimens are young, and that the female does not differ so materially from her mate. Besides the usual plaintive note, this species has also a cry almost exactly like that of the *C. fugax*, though of course much subdued and repeated faster. It is certainly the *C. flavus* apud Lesson (*Traité*), said to be from Bengal.”—*Ibid.*

*C. flavus.* In the *Zoologie du Voyage de M. Bélanger*, M. Lesson confounds, I am much inclined to suspect, at least three species under this name; viz. the Indian *niger*, the Malayan *flavus*, and the Australian *cineraceus* (figured by Messrs. Jardine and Selby, *Ill. Orn.*, pl. LXVII), stating that it appears to inhabit all the isles of Sunda, Bengal, the Phillipines, Port Jackson, and Van-Diemen’s Land. “A veritable Proteus,” he remarks, “this little Cuckoo seems indifferently to assume several phases of plumage, according to what island of the Indian Ocean it inhabits; at least unless a plurality of species be confounded under the same name, which differ from each other only by very indistinct and uncharacteristic shades of diversity. Buffon, or rather Daubenton, has figured by the name of *le Petit Coucou de l’Isle de Panay*, *Enluminure* 814, one type corresponding to the bird which M. Bélanger has brought from Java, where it had previously been met with by MM. Labillardière and Leschenault. *Sir Raffles* mentions it in his catalogue as occurring in Pulo Penang, and Dr. Horsfield informs us that it is the *Gedasse* of the Javanese.” This Malayan bird (which alone I apprehend to be the true *flavus*) is described as follows:—

“*Le Coucou à tête grise*, de Java, here described, is seven inches and a half (French) long. Its bill is blackish; the tarsi yellow. The head, cheeks, throat, and sides of the neck, are frosty-grey (*gris glacé*); a lustrous and silky bronze-brown, with tolerably bright (*doux*) reflections, prevails on the back and wings, a dark ashy tint on the croup, and russet on the quills. All the lower-parts of the body are russet (or ferruginous, *roux*), or tolerably vivid blonde. The middle tail-feathers are uniformly bronzed brown above; the lateral ones are brown marked (*frangées*) with white: underneath all of them are brown rayed with white, purer and more distinctly on the margins. A similar individual exists in the Paris museum, brought, according to Leseur, from the Straits of Entrecasteaux.”

Others from the various localities before cited “offer, upon examination, altogether the same characters, though we are compelled to recognise varieties of race, both according to size and the disposition of the colours of the plumage.”

The Australian race (*C. cineraceus*, Vigors and Horsfield, *Lin. Trans.* XV, 298; *Barred-tailed Cuckoo* of Latham, *Gen. Hist.* III, 310;), if the figure of it in Messrs. Jardine and Selby’s *Illustrations of Ornithology* (pl. LXVII) be correctly coloured, would seem to have the under-parts much deeper rufous than I have ever seen in Indian specimens, and the tail-feathers more broadly and conspicuously margined laterally with white. The following description is attached: — “The length of most specimens seems to be from nine to eleven inches. The upper-part of the plumage is a dull bluish-grey, on the wings tinged with brown, upon the tail nearly black; the throat is pale blue-grey, the rest of the under-parts reddish ochre-yellow, palest on the belly and vent; the inner webs of the quills are marked with white, which forms a diagonal bar across the under surface; the tail, with the exception of the centre-feathers, is deeply dentated with narrow white markings, which gives it nearly a barred appearance when expanded. The feet and legs appear to have been yellow. The females are generally duller in their colourings, and have the under-parts transversely barred with dull bluish-black. The young of the first year are dull umbre brown, with transverse darker markings.”

The Indian bird appears to be typically dark grey without any rufous, at least the old male, and according to Mr. Jerdon’s observation cited, some perhaps of the old females; but the ordinary dress of the adult female is, I suspect, as I have described it, namely, a garb corresponding to that so generally assumed by *C. poliocephalus* (*Himalayanus* of Vigors and Gould), and constituting the *hepaticus* variety of *C. canorus*: upon the first moult, the males appear generally to have the lower parts from the breast rufous, but rarely the upper part of the breast and fore-neck (as in the figure cited of the Australian *C. cineraceus*), indeed I have only seen one specimen thus characterized, and in this the colours of the entire under-parts are unusually dull and have some faint cross-striæ, indicative probably of a weakly individual. These states of plumage, together with the first or nestling dress, I have before minutely described.

It should be remarked, that I have seen no Indian specimen corresponding to the original description of *C. flavus* by Sonnerat and Daubenton, which would seem to have been unusually pale, having the "upper part of the head and throat light grey; the nape, back, and wings, pale umbre-brown; and the belly, thighs, and lower tail-coverts, pale yellow tinged with russet." The *C. rufivittatus*, Drapiez, may be presumed to refer to *C. flavus* in one or rather two of its phases; and his *C. pyrogaster* to one of these three species, if they be different. The latter point can only be decided by actual comparison of a number of specimens of each of them, and which way the probability lies cannot be suggested, as the Malayan *C. lugubris* is certainly distinct from the Indian *C. dicruroides*, though most closely allied to it, while *C. (Eudynamys) orientalis* spreads from India and China\* through the countries of the Indian Ocean into Australia,—*C. (Chrysococcyx) lucidus* is common to the two latter regions,—various other species to India and the Malay countries, and others again to India and Africa. *C. canorus* extends over Europe, Asia, and Africa, spreading southward (according to Dr. Horsfield) into Java, where however it would appear to be rare, and it is not quite clear that *C. micropterus* has not there been mistaken for it: certainly, however, I believe, (so far as has been yet observed,) its distribution does not reach into Australia.

The present group of small Cuckoos with naked tarsi, and further characterized by a particular type of colouring in all its varieties, appears to me to be fully as much entitled to subgeneric distinction, if not more so, than those of the Metalline Cuckoo (*Chrysococcyx*) and the Drongo Cuckoos (*Pseudornis*, Hodgson); and I suspect that *C. honoratus* should be referred to it. M. Lesson assigns the *C. flavus* to his *Surniculus*, which he founds upon *C. lugubris*†; thus mingling two very distinct subgenera, which must be acknowledged separately if either be systematically distinguished from the

\* The Society has just received specimens of both sexes from Macao.

† In Mr. G. R. Gray's List of the Genera of Birds, 1st edit. p. 57, *Surniculus* of Lesson is put as a synonym of *Eudynamys*; but erroneously, according to M. Lesson in the work here cited, where he remarks—"Le Coucou ugubre est pour nous le type d'un petit sous-genre qui semble confiné dans les îles de l'Est," &c.—*Zoologie du Voyage de M. Bélanger*, p. 236.



other subgenera of restricted *Cuculus* : and if he had not so expressly selected *C. lugubris* as the type of his *Surniculus*, it would have been convenient to have reserved this name for the present form, retaining Mr. Hodgson's *Pseudornis* for the Drongo Cuckoos; but such an arrangement would not be sanctioned by Zoologists, and it remains, therefore, to propose a distinctive appellation for the subgenus under consideration, which accordingly may be termed *Polyphasia*, allusive to the numerous variations of plumage assumed by the species.

Subgenus *Surniculus*, Lesson, 1834; *Pseudornis*, Hodgson: the DRONGO CUCKOOS. According to Mr. Hodgson, the sexes of *C. dicruroides* are similar; and such I believe also to be the case with those of *C. lugubris*, and that the Javanese specimen described by M. Lesson as the female of the latter must therefore be the young. "Length nine inches (French), of which the tail occupies five inches: bill black, and tarsi brown. The feathers around the beak tinged with rufous; those of the upper-parts are brown, with a steel-blue reflection deeper on the wings and tail; a number of small and round white specks, encircled with black, are sprinkled over the head, shoulders, and wings; all the under-parts of the body are brown, tinged with rufous on the fore-part of the neck, and sprinkled with small whitish round spots; the posterior tibial feathers incline to be whitish; wings brown, varied with white internally about the shoulder, and elsewhere on their under-surface they are brown, having a white ray; tail brown underneath, barred with whitish on its small feathers only."

Since the publication of my Monograph of Eastern *Cuculidæ*, I have received a second Singapore specimen of *C. lugubris*, which resembles that which I formerly described in its dimensions, and is merely somewhat brighter black, with no white specks whatever on its upper surface, and very few (and those but faint and confined to the abdomen) below; the exterior short pair of tail feathers are rather longer. It is not improbably a male, while the other may be presumed to be a female; and it may be added, that the conspicuous white occipital spot of the other specimen does not occur. The same difference is observable in two very fine specimens of *C. dicruroides* with which I have also been kindly favoured; and it is remarkable that these have the tail no more furcate than in *C. lugubris*, while their dimensions correspond with those of Mr. Hodgson's Nepålese examples. The



length of the wing affords a ready distinction between these two closely allied species, being in both specimens of *lugubris* but four inches and three-quarters, while in six specimens of *dicruroides* before me it averages five inches and a half (a mere trifle more or less).

Subgenus *Chrysococcyx*. There is a *Iampromorpha amethystina* described by Vigor in *P. Z. S.* 1831, p. 98, from Manilla; but it does not appear in what it differs from *Chr. xanclorhynchos*.

*Eudynamys orientalis*: the COËL. I am indebted to Mr. Frith for an egg of this species, found in the nest of *Corvus macrorhynchos*, together with one egg of that species. As the egg of *Cuculus canorus* bears a general resemblance in colour to those of the small ground-building birds in the nests of which it is most frequently deposited, so does the Coël's egg bear a marvellous resemblance to that of the Crow, being, however, much smaller. The specimen measures an inch and a half in length, and its colour is slightly bluish olive-green, rather pale than otherwise, with numerous reddish-brown spots (much as in some Blackbirds' eggs), and an indistinct zone of these near the large end. Mr. Frith has never found more than one Coël's egg in a nest, and has only met with it in those of the two Indian Crows. He has repeatedly seen the common Crow (*Corvus splendens*) attack and drive off the female Coël from its neighbourhood, and in one instance observed the latter, while trying to escape the pursuit, dash itself against a pane of glass in an out-house with so much force as to fall dead from the injury it received, the bill and fore-part of the head being quite smashed. I may add that the young nestling Coël, more especially the male, bears no small resemblance to a young Crow, *i. e.* a black one.

*Oxylophus Coromandus*: RED-WINGED CRESTED CUCKOO. Mr. Jerdon has seen specimens of this bird from the forests of Malabar.

*O. edolius*: PIED CRESTED CUCKOO. Of this species, the same naturalist has "obtained one young bird in the nest of *Malacocercus griseus*, in a thick hedge in Coimbatore. It has a loud peculiar call, which it only appears to utter when on the wing. In Telegoo it is called *Gollee kokeelah*, or 'Milkman Cuckoo,' it being said to call 'Gollee Gollee,' and when pronounced gutturally, these words have not at all a distant resemblance to its cry." Dr. Buchanan Hamilton also obtained the egg of this species in the nest of a *Malacocercus*, and figures it of a spotless blue colour, as is also the egg of its dupe; and

he states that this bird only visits Bengal during the rainy season, in which he appears to be correct.

Genus *Rhinortha*, Vigors; *Anadænus*, Swainson; also *Bubutus*, Lesson. In the Zoology of M. Bélanger's *Voyage*, M. Lesson has figured the *Rh. rufescens* of my monograph as *B. Isidori*, whilst his description of the latter refers to *Rh. chlorophæa* (*Cuculus chlorophæus*, Raffles, &c.); and by the name *B. Duvaucelii*, citing his *Ornithologie*, p. 143, (or *Cuculus Sumatrensis* of the Paris Museum, not *C. Sumatranus*, Raffles,) he has given a description which probably refers to my *rufescens*, though I cannot understand what is meant by the italicised portion of the following quotation, which alone does not apply — “Cet Oiseau, de la taille du Coucou Edolio, a le bec jaune, la tête d'un cendré blanchâtre, le plumage gris cendré, les ailles rousses, l'abdomen et la region anale d'un rouge ochreux,” &c. If it be intended that *the back* is coloured ash-grey, then probably M. Lesson's species is distinct. But it must be remembered that his description and plate of *B. Isidori* refer to different species, as before mentioned.

The *Phænicophæus longicaudatus* of my monograph is M. Lesson's *Melias tristis*, and may rank therefore as *Ph. tristis*, unless it be considered worth while to separate the small-billed species from the others: and my *Ph. tristis* appears to be M. Lesson's *M. Diardi*, of which he states that it resembles the former species in its form and colouring, but is only half the size, and presents some other differences; this bird is the *Cuculus Sumatranus* of Raffles, and must rank, I therefore presume, as *Ph. Sumatranus*. I am assured by Mr. Frith that this latter species occurs in the Soonderbuns of Bengal, and that the other is common on the hill ranges of Assam.

*Ph. Jerdoni* is “termed in Hindustani *Kuppra Popya*, and in Teloogoo *Wamaneh okee*.”—Jerdon.

*Zanclostomus Sirkee* is “called *Jungle Parrot*, both in Hindustani and Teloogoo, from its red bill.”—*Ibid*.

*Centropus Phillipensis* “builds a very large nest in some thick bush or hedge, and lays two or three greenish-blue eggs. This I have on the authority of an excellent *Shikaree*. It occasionally pilfers eggs from the nests of other birds.”—*Ibid*. When running up the bough of a tree, which it does with remarkable celerity, it often throws the tail up over the back.

*C. Sinensis* : *Polophilus Sinensis*, Shaw's *Zoology*, IX, 51. In my Monograph I referred this, with a note of doubt, to *C. Phillipensis*, but have since received the species from Chinghai, and it is closely allied to *C. lepidus*, but as large as *C. Phillipensis*, being very obviously distinct from both. Length about nineteen inches, of which the tail measures eleven inches, its outermost feathers four inches and a half less; wing seven inches and a half; and beak, which is much curved and robust, an inch and five-eighths to gape. Colouring much as in *C. lepidus*, but the head, neck, interscapularies, and under-parts, are considerably darker: the nape and interscapularies are dusky with whitish shafts, terminating in yellowish-white rigid and almost prickly tips; head browner, with shining dark shafts to the frontal plumes: the under-parts dingy-whitish, with dusky cross-bars on each feather, and also rigid yellowish-white tips, more particularly to the feathers of the throat and breast: scapularies dingy rufous; the wings brighter rufous, with nearly obsolete dark bars on their smaller coverts; the greater coverts, with the primaries, secondaries, and tertiaries, being in course of renewal, and those newly put forth are spotless rufous, whilst the unshed are barred with dusky: rump blackish; the tail and its upper coverts the same, barred with numerous whitish cross-rays: beak dusky-black, whitish along the edges of the mandibles and towards the tip of the under one; feet also blackish; and irides stated to be light horn, or coloured like the wings, though in the fully mature birds I presume they would be crimson.

“*C. Bengalensis* of my Supplement may be *C. lepidus*.”—Jerdon.

*Proceedings of the Asiatic Society.**(Friday Evening, 30th March, 1843.)*

The usual monthly Meeting was held on Friday evening the 3rd March 1843, the Hon'ble Sir J. P. GRANT, V. P. in the Chair.

Read the following memorandum circulated to the Committee of Papers by the Acting Secretary, with the usual reference respecting the proposed admission of Professor JULES MOHL of Paris, as an Honorary Member.

"This honour is solicited for Professor MOHL, by our associate and most zealous Agent at Paris, Major TROYER.

The Professor is well known as one of the most distinguished Oriental Scholars in Europe, and as Secretary to the Société Asiatique de Paris. He has also been for years a steady correspondent and a liberal contributor to our Library, and the warm friend of every Oriental Scholar visiting Paris; as well as, with Major TROYER, an active friend to our interests whenever they could serve them."

H. PIDDINGTON,  
*Acting Secretary Asiatic Society.*

The report of the Committee being unanimously in favour of Professor Mohl's nomination, he was therefore duly elected.

Dr. TRANTER, Nizam's Contingent, was also duly elected, and the usual communications were ordered to be made to these gentlemen. The following gentlemen were proposed as Members:—

The Hon'ble Sir LAWRENCE PEEL, Chief Justice of Bengal, and W. SETON KARR, Esq. B. C. S. both proposed by Sir J. P. GRANT, and seconded by Sir H. SETON.

Read, extract from the Proceedings of February, announcing the intention of the Hon'ble H. T. PRINSEP, to vacate the Chair of the Society in consequence of his departure for Europe.

Read the following letter from him, addressed to the Acting Secretary.

H. PIDDINGTON, Esq.

*Offg. Secretary Asiatic Society.*

SIR,—As the period is now just approaching for my departure from India, I think it necessary to place in your hands my resignation of the office of President of the Asiatic Society, and to request that you will lay it before the Committee of Papers, to be by them communicated to the General Meeting of next month.

I have the honor to be, Sir,

Your very obedient humble servant,

Calcutta, Friday, 18th February, 1843.

H. T. PRINSEP.

Read the following Minutes of a Special Meeting of the Committee of Papers, held at the Society's Rooms, on Thursday, 23rd February.



Thursday, 23d February, 1843.

At a Special Meeting of the Committee of Papers,

PRESENT.

The Honorable Sir H. SETON,  
Lieut. Colonel FORBES,  
CHARLES HUFFNAGLE, Esq., and  
The Acting Secretary,

Read the letter of the Honorable H. T. PRINSEP, resigning the chair of the Society.

1. Resolved.—That it be recommended to the Society, that a letter be addressed to the Honorable H. T. PRINSEP, expressing the deep regret of its members for the loss of his valuable aid, and their hope, that he would continue to forward the interests of the Society in Europe.

2. That it be farther recommended to the Society to request that its late President do oblige us by sitting for his Portrait (of Kit-Cat size,) and that a subscription be opened to defray the expence.

3. That it be farther recommended to the Society to request, that the Right Honorable W. W. BIRD, will be pleased to accept the President's chair.

The Honorable W. W. BIRD was unanimously elected President of the Society.

Read the following draft of a letter to be addressed to the Honourable H. T. PRINSEP:—

HONOURABLE SIR,—The Asiatic Society of Bengal has learnt with deep regret your resignation of its chair; a loss to its interests and to those of Oriental science and literature which it feels will not be easily repaired.

For its members fail not to recollect, Sir, at such a time, with how much zeal and perseverance, and for how many years, and even when pressed with the weight of official duties of the highest responsibility, you have devoted yourself, with untiring energy, to the pursuits of the scholar, the patient researches of the antiquary, and the minute and laborious investigations of the geographer and the historian, and what the fruits of these constant labours have been. Nor can they omit to mention, Sir, that you have ever been found the strenuous and able advocate of oriental literature, the generous and worthy associate and emulator of many of the great men whose labours adorn its annals and the records of their Society, and the kind and discerning patron of the humblest labourer in these and in many other fields: adding thus a lustre to the honoured name which you bear, and leaving to their Society the grateful duty of again enrolling that name amongst those of which it is so truly and so justly proud.

Deeply then, Sir, must the Asiatic Society regret the loss of one who has so much contributed to its advancement and to its reputation; but this regret is tempered by the confident hope which it now ventures to express, that, as the field which awaits you in Europe is not less a great, a noble, and an eminently useful one, you will still continue the same steady friend to the interests of Indian literature and science, which you have heretofore been.

Anxious, Sir, to possess some memorial of you, they now request that you will be pleased on your arrival to sit for your Portrait, which they are desirous of placing by the side of those of your predecessors in the Presidentship of the Society.

In conclusion. They beg to assure you, Sir, of their unfeigned respect, and to offer to you their best wishes for your future health and prosperity.

By order of the Society,

*Asiatic Society's Rooms, 4th February, 1843.* (Signed) H. PIDDINGTON,  
Acting Secretary Asiatic Society.



It was ordered—That the letter be signed by the Acting Secretary on the part of the Society, as had been done in former cases, (Presidents COLEBROOKE and HARRINGTON,) and agreed upon, that a deputation consisting of the Committee of Papers, and of such members as might please to attend, should meet at the Rooms, at ten o'clock the following morning, for the purpose of waiting on the Honourable Mr. PRINSEP with the letter, and from thence proceed to Government House, to notify to the Honourable Mr. BIRD, his election as President.

The following list of Books presented and purchased was read:—

#### LIBRARY.

*Books received for the Meeting of the Asiatic Society, on the 3rd March, 1843.*

The Calcutta Christian Observer, March, 1843, new series, vol. iv. No. 39.—Presented by the Editor.

Journal of the Bombay Branch of the Royal Asiatic Society, No. 4, April, 1842.

Journal des Savans. Paris, Aout, 1842.

Journal Asiatique, 3me serie. Paris. Avril, Mai, Juin, 1842, Nos. 73, 74, and 75, tome xiii.—Presented by the Society.

Proceedings of the American Philosophical Society, 1841-42, vol. ii, Nos. 18 to 22.

Transactions of the American Philosophical Society, new series. Philadelphia, 1841, vol. viii, part i.—Presented by the Society.

The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 3rd series. London, September, 1842, vol. xxi, No. 137.

Report of a Committee of the British Association for the advancement of Science, pamphlet.—Presented by the Society.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of January, 1843.—From the Surveyor General's Office.

Fonceux, Discours prononcé a l'ouverture du cours de Langue et de Literature Tibetaine, prés la Bibliotheque Royale. Paris, 1842, pamphlet.—Presented by the Author.

Fonceux, (Le sage et le fou.) Extrait du Kan — Jour. Paris, 1842, pamphlet.—Presented by the Editor.

Julien, Exercices pratiques d'Analyse de Syntaxe et de Lexicographie Chinoise. Paris, 1842, 8vo.

Darwin's Journal of Researches into the Geology and Natural History of the various countries visited by H. M. S. *Beagle*. London, 1839, 8vo.—Purchased.

Offrande au Dieu de L'Univers, par A. Fabius. Lyon, 1842, pamphlet.

The Oriental Christian Spectator, 2nd series. Bombay, August, 1842, vol. iii, No. 8.—Presented by the Editor.

Royle on the Production of Isinglass along the Coasts of India, with a Notice of its Fisheries. London, 1842, pamphlets, two copies. Presented by the Author.

The Acting Secretary informed the Meeting, that the sum of Rs. 76:10:3 having been paid as import duty on Professor Mill's Bust, (to clear it from the Custom House pending the application) he had applied to the Collector of Customs for a refund of this amount, which upon his favourable report to Government, was duly ordered and paid.

Read the following letter from the Officiating Secretary to Government of India, Military Department :—

No. 285.

*To the Secretary to the Asiatic Society.*

Military Department.

SIR,—I am directed to acknowledge the receipt of your letter of the 24th November last, and in reply to transmit to you, for the information of the Asiatic Society, a Copy of the Surveyor General's Despatch, No. 36, dated 13th August 1842, the original of which was recalled by an Office Memo. of the 5th December last.

2. The Surveyor General of India, with whom it may be expedient you should communicate on the subject of printing the Report upon the operations for measuring an Arc of the Meridian carried through the centre of the Peninsula to the Northern confines of Hindoostan, has received instructions to take the necessary steps to ensure the proper publication of the Report in the Researches of the Asiatic Society.

I am, Sir,

Your most obedient servant,

W. M. N. STURT, Major,  
*Officiating Secretary to the Government  
of India, Military Department.*

Council Chamber, 17th February 1843.

And from the Secretary to Government, General Department.

No. 21, OF 1843.

*From G. A. BUSHBY, Esq., Officiating Secretary to the Government of India, to  
H. PIDDINGTON, Esq., Acting Secretary to the Asiatic Society, Fort William,  
the 15th February, 1843.*

Political Department

SIR,—In acknowledging the receipt of your letter dated 22nd ultimo, I am directed to inform you, that His Honor the President in Council will be glad to have from the Asiatic Society, a few lithographed copies of the Inscription received from Aden, for the use of the Hon'ble the Court of Directors.

I have the honor to be, Sir,

Your most obedient Servant,

G. A. BUSHBY,

*Officiating Secretary to the Government of India.*

Fort William, 15th February, 1843.

From Secretary to the Government India.

*From Officiating Secretary to the Government of India, to H. PIDDINGTON, Esq., Acting Secretary Asiatic Society, dated Council Chamber, 17th February, 1843.*

Revenue Department.

SIR,—The Hon'ble the President in Council having reason to believe, that the attention of the Asiatic Society of Bengal has been directed to the subject of the Nurmah Cotton, I am desired by His Honor in Council to transmit to you, for the information of the Society, and for publication in its Journal, the accompanying copy of a dispatch, No. 4013, dated the 31st December last, from the Secretary to the Government, North-west Provinces, containing particulars on the subject.\*

I have the honor to be, Sir,

Your most obedient Servant,

FRED. JAS. HALLIDAY,

*Officiating Secretary to the Government of India.*

Read letter from the Secretary to the American Philosophical Society, acknowledging the receipt of the Journal of the Society, No. 22 to 29, new series.

Read the following extracts from a private letter from M. EUGENE BURNOUF, of Paris, to the address of the late Secretary, which as testifying the high degree of estimation in which the Society's Transactions and Journal are held at home, will be found of interest to its friends and supporters in India.

“Ce sera une chose bien honorable pour la Société dont vous êtes le digne organe, d'ajouter un volume nouveau aux nombreux et beaux volumes qu'elle a déjà publiés, les derniers, notamment, ont été particulièrement distingués entre tous, à cause de la richesse et de la nouveauté des matières qu'ils renferment. Il est à regretter que votre Société ait perdu par la mort prématurée de M. Csoma de Cörös le moyen de donner à l'Europe accès à la littérature Tibétaine qu'il connaissait si bien ; mais vous avez autour de vous un si grand nombre d'hommes éclairés, qu'il ne vous sera pas difficile de combler cette lacune en portant la lumière sur d'autres points non moins intéressants. Votre Société est dans une admirable situation dont elle a déjà su profiter glorieusement pour elle et utilement pour la science, et dont elle profitera certainement encore.

Je ne veux pas ternir, Monsieur, sans vous remercier très vivement de l'envoi que vous avez bien voulu me faire d'un certain nombre de numéros de votre Journal ; ce présent extrêmement précieux pour moi m'a prouvé que votre Journal, se soutenait à la hauteur où l'avait porté votre éminent prédécesseur J. Prinsep. C'est une chose capitale que ce Journal, et tous ceux qui en Europe le connaissent sont d'avis qu'il mérite que l'on fasse pour conserver son existence tous les sacrifices qui seront nécessaires.”

The following articles were presented to the Society by DR. HUTCHINSON, B. M. S. and were upon the table :—

1. A Tartar Bow, Arrows and Quiver.
2. A Tartar Cross Bow and Helmet.

\* This valuable Paper was handed over for publication in the Journal.

3. A 3-barrelled Pistol.

4 A Hat, worn by Malay Fishermen in the Straits.

And through S. G. T. HEATLY, Esq., from W. MALING, Esq., Baugundee, the following :—

1. An Oil-Nut, known familiarly as the Nepaul walnut, the kernel strongly savouring of the walnut, and very oleaginous. These specimens were procured from the garden of Mr. MALING at Baugundee, where the tree flourishes luxuriantly. It was said to be originally brought there by Mr. BECHER, formerly Salt Agent, and to be a Nepaulese plant.

2. A kind of lac obtained from the Gaub, supposed to contain a red dye of value.

#### ZOOLOGY OF NIPAL.

A Portfolio of 31 Specimen Drawings, being a few of the illustrations of this proposed splendid publication, for particulars of which see advertisement, and specimen drawing, was exhibited, and excited the highest interest by the beauty of the drawings, and their remarkable fidelity.

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#### *Report of the Curator Museum Economic Geology for the month of February.*

During the past month, we have received from Captain Goodwyn, Bengal Museum Economic Geology, Engineers a Model of a Terrace with a coating of half an inch of Asphaltum. The following letter accompanied it :—

No. 6504.

MR. PIDDINGTON,

*Curator to the Asiatic Museum.*

SIR,—I am directed by the Military Board, to annex copy of a letter No. 943 of the 8th instant, from Captain Goodwyn, and also to enclose a note from that officer of the same date.

2nd. The specimen of the native Asphaltum Rock mentioned in the note, accompanies this communication.

3rd. You will observe, that Captain Goodwyn is desirous of receiving an acknowledgment from you of the receipt of the specimens herewith forwarded.

I have the honor to be, Sir,

Your obedient Servant,

Fort William, Military Board }  
Office, 14th February, 1843. }

H. DEBUDE,  
Secretary, Military Board.

No. 943.

To Major H. DEBUDE,

*Secretary, Military Board.*

SIR,—I have the honor to forward a section of prepared terrace with Concrete (which in this country can be well made with Jamma and Hydraulic Cement,) and half an inch of Asphaltic Mastic. The section shews the different strata, and I have sent it to the Military Board as a specimen of the solidity and toughness of the material after remelting, for the purpose of being floated on to a terrace.

2nd. I have communicated with Capt. Tremenhere on the subject of the probability of discovering, in the Tenasserim provinces, a Geological bitu-



minous formation, from which something valuable might be obtained, and I at the same time sent him specimens of the raw material; but am sorry to learn from him in reply, that there is not any formation approaching that to which the mineral belongs.

I am now about to direct my enquiries in Arracan, as Petroleum wells and Naptha springs occur on the Irawaddy, and thence extend to the Arracan district.

I have, &c.

(Signed)

H. GOODWYN,

*Executive Engineer, 1st Division.*

*Barrackpore, 8th February, 1843.*

(True Copy,)

H. DEBUDE,

*Secretary, Military Board.*

MY DEAR DEBUDE,—I have already deposited in the Economic Geologic Museum, a specimen of the native Asphaltum Rock, so if the Board after examination of the accompanying are not desirous of keeping it in the Office, pray send it to Mr. Piddington with this note, that he may understand it is to be placed in juxtaposition with the rock I gave him before.

I send also a specimen of the Mineral Tar, an exudation from the crevices of the rock, which will complete the whole history, as the powder of the rock mixed with the Tar forms the Mastic which is on the prepared section of flooring in the box.

If it goes to the Museum, I shall be glad of a line from Piddington.

Your's truly,

H. GOODWYN.

In a private reply to Captain Goodwyn, the proximity of the Petroleum wells of Cheduba, as detailed in Captain Halstead's report, was pointed out to him, and the probability, that if the Asphaltum itself was not found there, the residue of the Petroleum might furnish a mineral Pitch, which mixed with lime would make a good Asphaltum. Experiments will be made on this highly interesting subject.

From — DUNCAN, Esq., we have received a highly curious contribution of a piece of the Porcelain Tower of Nankin.

Captain NEWBOLD has sent us, at my request, a specimen of the best Cotton Soil from Kurnool. He is good enough to promise us a complete series of soils from that quarter, which will be a great addition to our Museum, The following are extracts from his letter:—

*Camp Pialcoorty, Kurnool, February 13, 1843.*

MY DEAR SIR,—I have this day forwarded by banghy, a specimen of our first class cotton soil in Kurnool. Let me know whether it is enough, and whether I shall send specimens of the *various sorts* of cotton soil for the Society.

I have not yet been able to visit the first class Tobacco field yet, and I would rather defer sending specimens until personal examination of the field, lest any error should occur. The cotton soil now sent is from a field in the vicinity of which my tents are pitched.

I shall be very glad if you will favour me with an analysis at your early convenience.

A specimen of some of the cotton soil of the Ceded Districts, which I sent to the Royal Society is in the hands of Mr. Solly, who has promised



an analysis, I believe, to one of the Societies at home; but it had not been published at the time of my hurried departure from England. Professor Royle placed it in Mr. Solly's hands.

I was very much struck with the resemblance which the Regur soil that covers the *plateaux* of the Deccan bears to specimens of the "*Chorai Zem*," which Mr. Murchison brought with him from Russia, and which covers the Steppes of that country in a precisely similar manner.

The similarity also struck Mr. Lonsdale, the late talented Secretary of the Geological Society, who was also present at the Meeting when Mr. Murchison read his paper on the Geology of Russia in the last year.

Believe me,

Your's very truly,

T. J. NEWBOLD.

We have here to announce the recovery of the Catalogue of Captain Pemberton's Bootan specimens, which it will be remembered by his assistance in tracing out. The following is an extract from his private letter:—

Mineralogy and  
Geology.

Pemberton's Bootan specimens, which it will be re-  
collected from my reports, had been sent to us by

General McLeod, but without any Catalogue; this I have at length succeeded by his assistance in tracing out. The following is an extract from his private letter:—

"London, 5, Manchester Square, Christmas Day, 1842.

MY DEAR PIDDINGTON,—I had the pleasure of writing to you on the 30th ultimo, and then promised that I should write again, after Mrs. Pemberton and I should have an opportunity of looking into poor Pemberton's Journals, and I am happy to say, that we then discovered what we hope may prove useful in enabling you to carry out your views, regarding the collection I sent you, although the information appears rather meagre.

"As Mrs. Pemberton was so much better acquainted with his hand-writing than I am, she undertook to copy out all that we could discover on the subject, and when we were doubtful of the words, from our ignorance of Geology, she has underlined them; but she believes she made out almost all correctly. At all events, I have no doubt you will be able to clear up what may have appeared doubtful to us. We could discover nothing further than No. 138, nor could we find any Geological notes separate from this list. Enclosed you have Mrs. Pemberton's copy of the list, and it will afford us much pleasure to hear that it proves in any degree useful."

We have thus restored this very valuable collection to our Museum, and I have the pleasure to add, that we have also a complete set of duplicates of it, which will be packed for dispatch to the Honorable the Court of Directors.

In the course of my correspondence on the subject of Storms, during the past month I received from Mr. Howe, Marine Assistant to the Commissioner at Akyab, the following curious account of an eruption of one of their little volcanoes:—

*Khyouck Phyoo, Feb. 7, 1843.*

"We, however, had last night a most magnificent volcanic eruption. The mountain, which is of moderate height, and shaped somewhat like a pyramid, is about 3 or 4 miles from the station which was rendered as light as noon-day, though midnight at the time. The eruption commenced at about 11 P. M., unaccompanied by any rumbling, but throwing up masses and particles of lava to an immense height, and presenting a most magnificent spectacle, visible all round the country. The weather had been for some evenings previous, close and threatening, though the glass kept up, varying from  $30^{\circ} 12'$  to  $29^{\circ} 98'$  for the last 5 or 6 days.

"The fire gradually went out, and all was still again by about half an hour after midnight.

"This eruption takes place, from what I hear, generally once in two years, sometimes annually."

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We give with the present number, a specimen plate of the Chirú of Thibet, reduced from a folio-sized drawing, to accompany the Advertisement of the Illustrations of the Zoology of Nepal, to be published by Mr. Howard of London, which will be found at the end of the number; and it is but justice to the extraordinary native talent which has been thus developed amongst the Nipalese, by the means and patronage which have been so liberally afforded to them, by our talented associate to say, that judging from a port folio of the drawings lately exhibited at the Society's Meetings, nothing can surpass the truth and beauty of these Illustrations, which in the hands of Mr. Howard give every promise of being in the very highest degree worthy of the patronage of the Indian and European public.

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Pantholops nob Pan. Hodgson, Abel Chiru of Tibet

## Advertisement.

UNDER THE PATRONAGE

OF

**The Royal and Asiatic Bengal Societies ; and the  
Zoological Society,**

*Preparing for Publication, by Subscription,*

**ILLUSTRATIONS**

OF THE

**ZOOLOGY OF NIPAL.**

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### *Prospectus.*

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